

ACTON •  
MICKELSON •  
van DAM, INC.

CAD 064-573-108

Consulting Scientists, Engineers, and Geologists

June 19, 1994

Ms. Carla Slepak  
California Environmental Protection Agency  
Department of Toxic Substances Control  
1011 North Grandview Avenue  
Glendale, California 91201

21001.48/7

Subject: Area 317 RCRA Quarterly Ground Water Monitoring Report No. 23  
April through June 1994--Whittaker Corporation, Bermite Division  
22116 West Soledad Canyon Road, Santa Clarita, California 91350

Dear Ms. Slepak:

Enclosed is the Area 317 RCRA Quarterly Ground Water Monitoring Report for the twenty-third quarter, April through June 1994. The monitoring was completed according to the requirements of the Water Quality Monitoring and Response Plan for the Interim Status Area 317 Surface Impoundment.

The statistical analyses for this sampling event showed that the established tolerance limits for pH, specific conductance, chloride, sulfate, TCE, TOC, or TOX were not exceeded. The tolerance limit for sodium was exceeded for the sample from monitoring well MW-10.

Please call me at (916) 939-7550 if there are any questions regarding the enclosed report.

Sincerely,

ACTON • MICKELSON • van DAM, INC.



Barbara J. Mickelson, P.E.

BJM:mjd  
Enclosure

cc/enc: Mr. Gordon Louttit, Esq., Whittaker Corporation  
Mr. Glen AbdunNur, Bermite Division  
Ms. Lily Herskovits, U.S. Environmental Protection Agency, Region IX  
Mr. Jim Ross, Los Angeles Regional Water Quality Control Board

ltr398.mj

4511 Golden Foothill Parkway, Suite 1  
El Dorado Hills, California 95762

(916) 939-7550  
Fax (916) 939-7570

AREA 317 RCRA QUARTERLY  
GROUND WATER MONITORING REPORT NO. 23  
APRIL THROUGH JUNE 1994

---

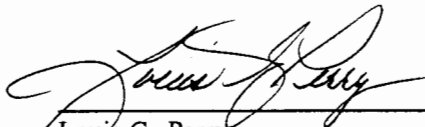
WHITTAKER CORPORATION,  
BERMITE DIVISION FACILITY  
22116 WEST SOLEDAD CANYON ROAD  
SANTA CLARITA, CALIFORNIA 91350  
AMV PROJECT NO. 21001.48

August 19, 1994

Prepared By


ACTON • MICKELSON • van DAM, INC.  
4511 Golden Foothill Parkway, #1  
El Dorado Hills, California 95762  
(916) 939-7550

PREPARED BY:

  
\_\_\_\_\_  
Louis G. Perry  
Staff Engineer

Date 8/19/94

REVIEWED BY:

  
\_\_\_\_\_  
Barbara J. Mickelson, P.E.  
California Registered Professional  
Engineer #43417

Date 8/19/94



## TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES . . . . .	ii
LIST OF FIGURES . . . . .	ii
1.0 INTRODUCTION . . . . .	1
2.0 GROUND WATER LEVEL MEASUREMENTS . . . . .	2
3.0 SAMPLE COLLECTION AND ANALYSIS . . . . .	3
3.1 Required Ground Water Analyses . . . . .	3
3.2 Approved Analytical Methods . . . . .	4
4.0 GROUND WATER SAMPLE ANALYTICAL RESULTS . . . . .	4
4.1 Ground Water Monitoring Parameters . . . . .	4
4.2 Background Water Quality Parameters . . . . .	6
5.0 STATISTICAL ANALYSIS OF RESULTS TO DATE . . . . .	6
5.1 Assumptions Used in the Statistical Analysis . . . . .	7
5.2 Data Preparation . . . . .	7
5.3 Results . . . . .	8
6.0 SUMMARY . . . . .	8
6.1 Ground Water Level Measurements . . . . .	8
6.2 Ground Water Monitoring Parameters . . . . .	8
6.3 Background Water Quality Parameters . . . . .	9
6.4 Statistical Analysis . . . . .	9
7.0 RECOMMENDATIONS . . . . .	9
8.0 REMARKS . . . . .	9
APPENDIX A. DOCUMENT SUBMITTAL CHRONOLOGY	
APPENDIX B. GROUND WATER SAMPLING PROCEDURES	
APPENDIX C. CHAIN-OF-CUSTODY FORMS	
APPENDIX D. SAMPLE ANALYSES REQUEST FORMS	
APPENDIX E. FGL QUALITY ASSURANCE/QUALITY CONTROL PROGRAM	
APPENDIX F. BLANK, DUPLICATE, AND SPIKE SAMPLE ANALYTICAL REPORTS	
APPENDIX G. ANALYTICAL REPORTS FOR BACKGROUND WATER QUALITY PARAMETERS AND GROUND WATER MONITORING PARAMETERS	
APPENDIX H. STATISTICAL ANALYSES	

## LIST OF TABLES

TABLE 1.	POTENTIOMETRIC SURFACE ELEVATIONS
TABLE 2.	GROUND WATER MONITORING PARAMETER ANALYSES FOR SAMPLES COLLECTED JUNE 22, 1994
TABLE 3.	BACKGROUND WATER QUALITY PARAMETERS

## LIST OF FIGURES

FIGURE 1.	SITE LOCATION
FIGURE 2.	AREA 317 GROUND WATER MONITORING WELL LOCATIONS AND ESTIMATED GROUND WATER FLOW DIRECTION (6/21/94)
FIGURE 3.	POTENTIOMETRIC SURFACE ELEVATIONS (THROUGH JUNE 1994)

**AREA 317 RCRA QUARTERLY  
GROUND WATER MONITORING REPORT NO. 23  
APRIL THROUGH JUNE 1994**

---

**WHITTAKER CORPORATION, BERMITE DIVISION FACILITY  
22116 WEST SOLEDAD CANYON ROAD  
SANTA CLARITA, CALIFORNIA 91350**

## **1.0 INTRODUCTION**

The Whittaker Corporation, Bermite Division (Whittaker) facility (site) is located at 22116 West Soledad Canyon Road in Santa Clarita, California (Figure 1). At the time operations were terminated in April 1987, Whittaker had interim status permits for 14 Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Units (HWMUs) at the site. A document entitled "Whittaker Corporation, Bermite Division, Santa Clarita, California, CAD064573108, Facility Closure Plan Modifications" (Closure Plan), was prepared by Whittaker and approved by the California Environmental Protection Agency, Department of Toxic Substances Control (Cal-EPA) and U.S. Environmental Protection Agency (U.S. EPA) on December 28, 1987. Outlined in the Closure Plan are procedures for obtaining approval by Cal-EPA and U.S. EPA of clean closure certification for the different HWMUs, including the 317 Surface Impoundment (Area 317).

Required in the Closure Plan is the implementation of a ground water monitoring system at Area 317 capable of detecting and assessing the impact of the HWMU on the uppermost aquifer at the site. Implementation of a ground water monitoring system is described in the document entitled "Water Quality Monitoring and Response Plan for the Interim Status Area 317 Surface Impoundment," dated October 9, 1992 (Area 317 Plan). This is a revised response plan approved by Cal-EPA which meets the requirements of the revisions to Title 22 and expands the constituents sampled and reported. The revised Area 317 Plan has been utilized for the nineteenth and subsequent sampling events.

A total of six ground water monitoring wells (MW-1, MW-3, MW-4, MW-5, MW-6, and MW-10) have been installed around Area 317 (Figure 2). Reports detailing the location and construction of monitoring wells, sampling and analysis plans for collecting and analyzing ground water samples from the ground water monitoring wells, abandonment of monitoring well MW-4, and quarterly sampling results which have been submitted to Cal-EPA and U.S. EPA are listed in Appendix A of this report.

Quarterly ground water sampling activities were initiated on October 3, 1988, for monitoring wells MW-1, MW-3, and MW-4. The ground water monitoring program includes analyses of water samples for volatile organic compounds (VOCs). Laboratory analytical results from the third quarterly sampling event reported trichloroethene (TCE) at 4,800 micrograms per liter

( $\mu\text{g/l}$ ) in the ground water sample collected from monitoring well MW-4. As a result of this detection of TCE in the sample from monitoring well MW-4, two additional monitoring wells were installed in Area 317 (MW-5 and MW-6).

The fourth quarterly monitoring event included sampling of the ground water from monitoring wells MW-1, MW-3, and MW-4. Monitoring wells MW-5 and MW-6 were not equipped for sampling during the fourth quarterly sampling event. Analytical results from the fourth quarter were similar to those reported in the third quarterly sampling event. The concentrations of VOCs reported in samples collected from monitoring wells MW-1 and MW-3 were below laboratory reporting limits; however, analysis of the ground water sample collected from monitoring well MW-4 reported TCE at 7,200  $\mu\text{g/l}$ . Analysis of ground water samples collected from monitoring well MW-4 during the fifth through twelfth quarterly sampling events reported a steady decline in TCE concentration. Based on the results of the initial four sampling events, a reduced list of chemical parameters, approved by Cal-EPA, was utilized for the fifth through eighteenth quarterly sampling events.

Statistical analysis of indicator parameters (currently referred to as ground water monitoring parameters) was also initiated during the fifth quarterly sampling event. The ground water samples collected and analyzed for indicator parameters (ground water monitoring parameters) from monitoring wells MW-1, MW-3, and MW-4 for the initial year of monitoring were evaluated to assess whether statistically significant changes to the ground water had occurred as a result of site activities.

A Comprehensive Ground Water Monitoring Evaluation (CME) was conducted by Cal-EPA on January 24 and 25, 1990, during the sixth quarterly monitoring event. Personnel from Cal-EPA were present during all phases of the sixth quarterly monitoring event, from the taking of initial potentiometric surface elevation measurements to the sealing of the coolers containing the quarterly ground water samples.

Ground water samples from monitoring wells MW-1, MW-3, MW-5, MW-6, and MW-10 were collected on June 22, 1994. The results of the twenty-third quarterly ground water sampling event are presented in this report, along with recommendations for future quarterly ground water sampling events.

## 2.0 GROUND WATER LEVEL MEASUREMENTS

Water level measurements were collected on June 21, 1994, prior to well evacuation and sampling activities. Monitoring well locations with respect to Area 317 are shown on Figure 2. Water levels were measured to the nearest 0.01 foot.

Water level elevations have decreased 51.59, 51.13, 37.61, and 38.22 feet in monitoring wells MW-1, MW-3, MW-5, and MW-6, respectively, since the initiation of RCRA ground water monitoring activities at Area 317. The water level elevation has increased 5.29 feet in monitoring well MW-10 since installation. Water level elevations decreased 1.36, 1.25, 2.28, 1.99, and 1.91 feet in monitoring wells MW-1, MW-3, MW-5, MW-6, and MW-10, respectively, between the twenty-second and twenty-third quarters. Table 1 summarizes potentiometric surface elevation data for monitoring wells in Area 317. Figure 3 graphically illustrates the changes in potentiometric surface elevations in monitoring wells MW-1, MW-3, MW-5, MW-6, and MW-10 over time.

A local ground water flow direction for June 21, 1994, has been estimated utilizing the potentiometric surface elevation data collected that day. Figure 2 illustrates the estimated potentiometric surface contours and the resultant estimated flow direction for June 21, 1994, which is toward the north-northeast. Based upon this data, monitoring well MW-6 is estimated to be located hydraulically downgradient from Area 317, monitoring wells MW-1, MW-5, and MW-10 are estimated to be located hydraulically crossgradient from Area 317, and monitoring well MW-3 is estimated to be located hydraulically upgradient from Area 317. The ground water flow direction estimated for June 21, 1994, is generally similar to the flow direction estimated for the previous sampling event. The estimated ground water flow direction has varied from north-northwest to north-northeast since quarterly ground water monitoring was initiated, which may represent a contributing factor to the reported variability in ground water chemistry.

### **3.0 SAMPLE COLLECTION AND ANALYSES**

Ground water evacuation, stabilization, and sampling procedures are outlined in Appendix B.

#### **3.1 Required Ground Water Analyses**

A reduced analytical parameter testing list was approved by Cal-EPA after submittal of "Quarterly Sampling Report No. 4." As of the fifth quarter, ground water samples from monitoring wells MW-1 and MW-3 were analyzed for the following: sulfates, chlorides, total phosphate, pH, specific conductance, total organic carbon (TOC), total organic halogens (TOX), and dissolved metals (antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium, and thallium) by EPA-approved methods. Ground water samples collected from monitoring wells MW-5, MW-6, and MW-10 were analyzed for pH, specific conductance, TOC, TOX, and VOCs by EPA-approved methods. With approval of the new Area 317 Plan, iron, manganese, and sodium were added to the analytical parameter testing list. Additionally, fluoride, gross alpha, gross beta, lead, nitrate, and turbidity were added temporarily to the analytical parameter testing list as background water quality parameters while total phosphates and other metals were removed from the list.

For the April through June 1994 sampling event, the following analytical parameters were tested:

- Ground Water Monitoring Parameters: pH, specific conductance, TOC, TOX, TCE, sulfate, sodium, manganese, iron, and chloride.
- Background Water Quality Parameters: fluoride, nitrate, lead, gross alpha, gross beta, and turbidity.

All ground water samples collected during the twenty-third sampling event were submitted to FGL Environmental (FGL) in Santa Paula, California. FGL is certified by Cal-EPA to perform the ground water analyses outlined in the Closure Plan. Chain-of-custody and sample analyses request forms are included in Appendices C and D, respectively.

A description of FGL's Quality Assurance/Quality Control (QA/QC) program is provided in Appendix E. Copies of the laboratory analytical reports for all trip, field, and method blanks, and duplicate and spiked samples analyzed by FGL are provided in Appendix F.

### **3.2 Approved Analytical Methods**

Ground water monitoring parameters were analyzed by EPA or other approved methodologies. Analytical methodologies were presented in the "Ground Water Sampling and Analysis Plan," dated August 1988. Modifications to this plan were approved by Cal-EPA prior to the fifth quarterly sampling event. Copies of the laboratory test method protocol were included in Appendix B of "Quarterly Sampling Report No. 1," dated December 1988.

A summary of sample volumes, sample containers, and laboratory analytical methods utilized during the twenty-third sampling event is presented in Table B-3, Appendix B. Procedures regarding sample containers, sample labeling, sample collection, and field QA/QC are outlined in Appendix B.

## **4.0 GROUND WATER SAMPLE ANALYTICAL RESULTS**

### **4.1 Ground Water Monitoring Parameters**

Ground water samples from each monitoring well were analyzed for pH, specific conductance, chloride, iron, manganese, sodium, sulfate, TCE, TOC, and TOX to serve as ground water monitoring parameters. Table 2 summarizes the results of the ground water monitoring parameter analyses. Copies of the original laboratory data sheets are presented in Appendix G.



Laboratory pH measurements of 7.5, 7.6, 7.7, 7.7, and 7.8 were recorded for samples collected from monitoring wells MW-1, MW-3, MW-5, MW-6, and MW-10, respectively, for the twenty-third sampling event. The laboratory pH measurements recorded for samples collected from the monitoring wells during the twenty-third sampling event were generally consistent with the measurements recorded during previous sampling events.

Specific conductance measurements of 740, 630, 540, 550, and 610 micromhos per centimeter squared ( $\mu\text{mhos}/\text{cm}^2$ ) were recorded for samples collected from monitoring wells MW-1, MW-3, MW-5, MW-6, and MW-10, respectively, for the twenty-third sampling event. The specific conductance measurements recorded during the twenty-third sampling event are generally consistent with measurements recorded during previous sampling events.

The results for chloride, sodium, and sulfate were 150, 54, and 15 milligrams per liter (mg/l) for the sample from monitoring well MW-1; 29, 53, and 71 mg/l for the sample from monitoring well MW-3; 40, 54, and 35 mg/l for the sample from monitoring well MW-5; 65, 58, and 30 mg/l for the sample from monitoring well MW-6; and 64, 86, and 39 mg/l for the sample from monitoring well MW-10. Laboratory results for iron were 150, <50, 70, 70, and <50  $\mu\text{g}/\text{l}$  for the ground water samples collected from monitoring wells MW-1, MW-3, MW-5, MW-6, and MW-10, respectively, for the twenty-third sampling event. Manganese was reported at less than the detection limit in samples collected from all five monitoring wells. The results for manganese, iron, sodium, chloride, and sulfate are generally consistent with results from previous sampling events.

TCE was reported at less than the detection limit (0.5  $\mu\text{g}/\text{l}$ ) in samples from all five monitoring wells. These results for TCE from ground water samples from Area 317 monitoring wells are consistent with the previous sampling event.

TOC was reported at less than 0.5 mg/l in all samples collected from Area 317 monitoring wells during the twenty-third sampling event. The TOC measurements recorded during the twenty-third sampling event are generally consistent with measurements recorded during previous sampling events.

TOX were reported at less than 5 $\mu\text{g}/\text{l}$  in samples collected from Area 317 monitoring wells MW-1, MW-5, and MW-6. The TOX measurements reported for samples collected from monitoring wells MW-3 and MW-10 on June 22, 1994, were 8 and 20  $\mu\text{g}/\text{l}$ , respectively. Detectable concentrations of TOX have not been reported in MW-3 since the March 1992 sampling event or in MW-10 since the October 1992 sampling event. Since TOX has been infrequently detected in Area 317 wells during previous monitoring events, the present detections reported are not inconsistent with previous results. The statistical inference, based on the methodology described below, is that the present TOX detections are not outside the established tolerance limit for this parameter and do not appear to be problematic at this time.

Copies of the laboratory analytical reports for the ground water monitoring parameters are included in Appendix G.

#### **4.2 Background Water Quality Parameters**

Background water quality parameters were established with four sets of analytical data. The analytical results for samples from monitoring wells MW-1 and MW-3 were utilized to establish the background water quality parameters. The background water quality parameters will not be tested again unless there is evidence of a release at any ground water monitoring point (i.e., monitoring well sample analytical data reported outside the established tolerance limits). Table 3 summarizes the results of the background water quality parameter analyses.

#### **5.0 STATISTICAL ANALYSIS OF RESULTS TO DATE**

As was indicated in the document entitled "Ground Water Sampling and Analysis Plan," dated August 1988, and required in 40 CFR Part 265.92, statistical analysis of the indicator parameters (currently referred to as ground water monitoring parameters) was previously performed to determine whether a statistically significant difference in the water quality existed between the individual downgradient monitoring wells and the upgradient or background monitoring wells. At that time, monitoring wells MW-1 and MW-3 were considered upgradient or crossgradient relative to Area 317, and monitoring wells MW-5, MW-6, and MW-10 were considered downgradient or crossgradient relative to Area 317.

After four quarters of sampling and analysis of the monitoring system, the mean, standard deviation, variance, and coefficient of variance of the four indicator (ground water monitoring) parameters were calculated. These values were reported to Cal-EPA in correspondence to Mr. Alan Sorsher, P.E., Cal-EPA, from Wenck Associates Inc. (Wenck), dated October 25, 1989. The statistical analysis, presented in the fifth through tenth quarterly sampling reports, indicated only one statistically significant difference in water quality as determined by the indicator (ground water monitoring) parameters. This was interpreted by Wenck to be caused by erroneous TOC results from the sixth quarter.

Since the approval of the Area 317 Plan by Cal-EPA, the statistical comparison of analytical results for each downgradient monitoring well is made against the tolerance limits for the ten established ground water monitoring parameters (chloride, sulfate, iron, manganese, sodium, TCE, TOC, TOX, specific conductance, and pH). The tolerance limits for the ground water monitoring parameters will be updated at a minimum annually to include the latest analytical data.

Concentrations of the ground water monitoring parameters in the ground water samples collected from Area 317 monitoring wells for the twenty-third quarter are included in Table H-1, presented in Appendix H. A summary of the quarterly statistics for each background monitoring well and the tolerance limit calculations for the ground water monitoring parameters are presented in Appendix H, Tables H-2, H-3, and H-4. Graphical presentation of the statistical information is also included in Appendix H.

### 5.1 Assumptions Used in the Statistical Analysis

As recommended in the document entitled "RCRA Ground Water Monitoring Technical Enforcement Guidance Document," the data points that are less than the detection limit have been given a value equal to one-half the detection limit of the analyte. As recommended in the document entitled "Statistical Analysis of Ground Water Monitoring Data at RCRA Facilities, Interim Final Guidance" (Guidance Document), the statistical analysis assumes a value for the confidence coefficient (1- $\alpha$ ) of 0.95 and a value for the proportion ( $y$ ) of 0.95. This translates to a 95 percent confidence that 95 percent of future background monitoring well results will fall within the tolerance interval predicted. The tolerance limits for pH were calculated using a two-tailed distribution, and the tolerance limits for the other parameters were calculated using a one-tailed distribution. It was assumed that the data are distributed normally.

### 5.2 Data Preparation

The ground water sample analytical results from the two background or upgradient monitoring wells (MW-1 and MW-3) for all 23 quarters of ground water sampling to date and the three downgradient monitoring wells (MW-5, MW-6, and MW-10) for the twenty-third quarter of ground water sampling have been tabulated and prepared for statistical analysis. In accordance with the tolerance limit methodology used for this statistical analysis, the analytical results for the ten ground water monitoring parameters are summarized by quarter and by monitoring well. Arithmetic mean and standard deviation summary statistics have been calculated and are utilized in calculating the tolerance limits for each of the ground water monitoring parameters.

The statistical analysis for the ground water monitoring parameters involves testing the ground water quality downgradient of Area 317 against the set of tolerance limits, i.e., that there are no excursions of the tolerance limits, which are based on the average of all the quarterly statistics for each of the ten ground water monitoring parameters for background monitoring wells MW-1 and MW-3, compared to the twenty-third quarter results for each of the downgradient monitoring wells MW-5, MW-6, and MW-10 (Table H-1).

The calculations of the quarterly statistics were performed in the same manner as was outlined in the Area 317 Plan. The values of K were taken from the statistical tables based on the number of samples and a one-sided tolerance limit. (An example calculation is included in Appendix H.) Note that pH values have not been reported as hydrogen ion concentrations as was done previously and that the value of K for the analysis of pH is derived from the tables

for two-sided tolerance limits. Manganese and TCE have never been reported above the detection limit in samples from monitoring wells MW-1 and MW-3; therefore, the tolerance limit for these parameters is set at the detection limit.

### 5.3 Results

The twenty-third quarter results for each ground water monitoring parameter at each downgradient monitoring well were compared to the tolerance limits based on the first through twenty-third quarter results for background monitoring wells MW-1 and MW-3. The statistical analysis indicates that there is no excursion of tolerance limits of pH, specific conductance, chloride, sulfate, iron, manganese, sodium, TCE, TOC, or TOX in downgradient ground water quality, except for sodium in the sample from monitoring well MW-10. Because the concentration of sodium in monitoring well MW-10 had exceeded the defined tolerance limit during three previous sampling events, samples from each of the three downgradient or crossgradient wells, MW-5, MW-6, and MW-10, were analyzed for all six background parameters during the twenty-third monitoring event. Analysis of the data indicates that the concentrations of background water quality parameters in wells MW-5, MW-6, and MW-10 are consistent with the historical data for these parameters in upgradient wells MW-1 and MW-3. The elevated sodium concentration in monitoring well MW-10 relative to sodium concentrations in the other four Area 317 wells has not indicated a statistical impact with respect to the concentration of any other water quality parameters.

## 6.0 SUMMARY

### 6.1 Ground Water Level Measurements

Based upon the June 21, 1994 data, the estimated direction of ground water flow is toward the north-northeast, which is generally consistent with the ground water flow direction estimated during the previous sampling event. Utilizing this data, monitoring well MW-6 is estimated to be located hydraulically downgradient from Area 317; monitoring wells MW-1, MW-5, and MW-10 are estimated to be located hydraulically crossgradient from Area 317; and monitoring well MW-3 is estimated to be located hydraulically upgradient from Area 317.

### 6.2 Ground Water Monitoring Parameters

The pH reported in samples from the five monitoring wells ranged from 7.5 (monitoring well MW-1) to 7.8 (monitoring well MW-10). The specific conductance in samples from the five monitoring wells ranged from 520  $\mu\text{mhos}/\text{cm}^2$  (monitoring wells MW-5 and MW-6) to 730  $\mu\text{mhos}/\text{cm}^2$  (monitoring well MW-1). TOC was reported at less than 0.5 mg/l in samples from all five monitoring wells. TOX detection occurred in monitoring wells MW-3 (8  $\mu\text{g}/\text{l}$ ) and MW-10 (20  $\mu\text{g}/\text{l}$ ). The reported TOX concentrations in MW-3 and MW-10 are not outside the

established tolerance limit for this parameter. The pH, specific conductance, TOC, and TOX results reported for the twenty-third sampling event are generally consistent with the results reported for the previous sampling events.

The constituent of concern for Area 317 is TCE, which was reported as less than the detection limit in samples from all five monitoring wells. This result is consistent with the previous sampling event.

The ground water sample analytical results for chloride, iron, manganese, sodium, and sulfates from the five monitoring wells are generally consistent with the existing data. All are under the tolerance limits, except for sodium in the sample from monitoring well MW-10.

### **6.3 Background Water Quality Parameters**

Monitoring wells MW-1 and MW-3 were sampled for each of the six background water quality parameters during the twenty-third quarter to complete the parameter set. Other background water quality parameters were not tested in this quarter.

### **6.4 Statistical Analysis**

The statistical analyses indicate that the tolerance limits set by the analysis of background water quality are not exceeded for pH, specific conductance, chloride, sulfate, iron, manganese, TCE, TOC, or TOX in the downgradient monitoring wells. The tolerance limit for sodium was exceeded for the sample from monitoring well MW-10.

## **7.0 RECOMMENDATIONS**

Based upon the data collected, current regulatory guidelines, and the professional judgment of AMV, the following recommendations are presented:

- Conduct future sampling events in accordance with the procedures set forth in the document entitled "Water Quality Monitoring and Response Plan for the Interim Status Area 317 Surface Impoundment," dated October 9, 1992.
- Update the tolerance limits for the ground water monitoring parameters following the twenty-fourth quarterly sampling event.

## 8.0 REMARKS

The recommendations contained in this report represent our professional opinions. These opinions are based on currently available information and were developed in accordance with currently accepted hydrogeologic and engineering practices at this time and location. Other than this, no warranty is implied or intended.

TABLE 1

POTENTIOMETRIC SURFACE ELEVATIONS  
RCRA GROUND WATER MONITORING WELLS  
WHITTAKER CORPORATION, BERMITE DIVISION

Well No.	MW-1	MW-3	MW-4	MW-5	MW-6	MW-10
Top of Casing Elevation <sup>a</sup>	1,561.32	1,538.51	1,538.43	1,493.37	1,521.09	1,537.49
Date	Potentiometric Surface Elevations <sup>a</sup>					
12/23/87	1,107.81	-- <sup>b</sup>				
01/27/88	1,108.03	1,109.51				
02/03/88	1,108.32	1,109.88				
02/04/88	1,108.36	1,109.14				
02/05/88	1,108.36	1,109.17				
02/09/88	1,108.24	1,109.13				
02/10/88	1,108.28	1,109.27				
02/12/88	1,108.28	1,109.27				
02/19/88	1,108.11	1,108.86				
03/28/88	1,107.69	1,108.23				
04/05/88	1,107.76	1,108.23				
04/12/88	1,107.66	1,108.23				
04/19/88	1,107.56	1,108.23				
04/26/88	1,107.61	1,108.23				
05/02/88	1,107.86	1,108.23				
07/27/88	1,103.58	1,104.19	1,102.61			
10/03/88	1,101.75	1,102.11	1,100.77			
01/23/89	1,099.82	1,100.25	1,098.92			
04/17/89	1,097.37	1,097.62	1,096.05			
07/27/89	1,094.67	1,094.85	1,093.53	1,093.02	1,093.15	
08/10/89	1,093.93	1,094.09	1,092.89	1,092.32	1,092.49	
08/18/89	1,093.62	1,093.76	1,092.64	1,092.03	1,092.19	
10/30/89	1,092.07	1,092.16	1,091.08	1,090.62	1,090.64	
01/24/90	1,090.56	1,090.54	1,089.68	1,089.17	1,089.50	
04/16/90	1,088.66	1,088.78	1,087.83	1,087.23	1,087.32	
07/16/90	1,083.56	1,083.53	1,082.29	1,081.41	1,081.85	
10/17/90	1,079.91	1,079.78	1,078.86	1,078.25	1,078.56	
01/28/91	1,076.52	1,076.54	1,075.46	1,074.64	1,074.91	
04/22/91	1,071.22	1,071.29	1,069.75	1,068.90	1,069.25	
07/17/91	1,063.63	1,063.79	1,061.66	1,060.53	1,061.14	
10/08/91	1,055.22	1,055.41	1,053.28	1,052.12	1,052.69	
01/29/92	1,051.88	1,052.29	1,050.63	1,049.76	1,050.06	1,050.57
04/20/92	1,050.47	1,050.88	1,049.33	1,048.78	1,048.92	1,049.37
07/28/92	1,046.84	1,047.40	-- <sup>c</sup>	1,045.14	1,045.20	1,045.77
10/19/92	1,043.87	1,044.58	-- <sup>c</sup>	1,042.05	1,042.13	1,042.77
01/25/93	1,044.79	1,045.61	-- <sup>c</sup>	1,044.22	1,043.64	1,044.29
06/07/93	1,049.24	1,050.36	-- <sup>c</sup>	1,049.19	1,048.70	1,049.21
09/20/93	1,052.40	1,054.11	-- <sup>c</sup>	1,052.47	1,051.79	1,052.53
12/06/93	1,054.26	1,056.27	-- <sup>c</sup>	1,054.29	1,053.58	1,054.53
03/07/94	1,057.58	1,059.63	-- <sup>c</sup>	1,057.69	1,056.92	1,057.77
06/21/94	1,056.22	1,058.38	-- <sup>c</sup>	1,055.41	1,054.93	1,055.86

<sup>a</sup>NGVD = National Geodetic Vertical Datum.

<sup>b</sup>Measurement not recorded.

<sup>c</sup>Monitoring well abandoned 05/28/92.

TABLE 2

GROUND WATER MONITORING PARAMETER ANALYSES  
FOR SAMPLES COLLECTED JUNE 22, 1994

Parameter	Units	Detection Limit	Monitoring Well No.				
			MW-1	MW-3	MW-5	MW-6	MW-10
pH			7.5	7.6	7.7	7.7	7.8
Specific Conductance	$\mu\text{mhos}/\text{cm}^2$	1	740	630	540	550	610
Chloride	mg/l	1	150	29	40	65	64
Iron	$\mu\text{g}/\text{l}$	50	150	<50	70	70	<50
Manganese	$\mu\text{g}/\text{l}$	30	<30	<30	<30	<30	<30
Sodium	mg/l	1	54	53	54	58	86
Sulfate	mg/l	1	15	71	35	30	39
TCE <sup>a</sup>	$\mu\text{g}/\text{l}$	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TOC <sup>b</sup>	mg/l	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
TOX <sup>c</sup>	$\mu\text{g}/\text{l}$	5	<5	8	<5	<5	20

<sup>a</sup>TCE = Trichloroethene.

<sup>b</sup>TOC = Total Organic Carbon.

<sup>c</sup>TOX = Total Organic Halogens.



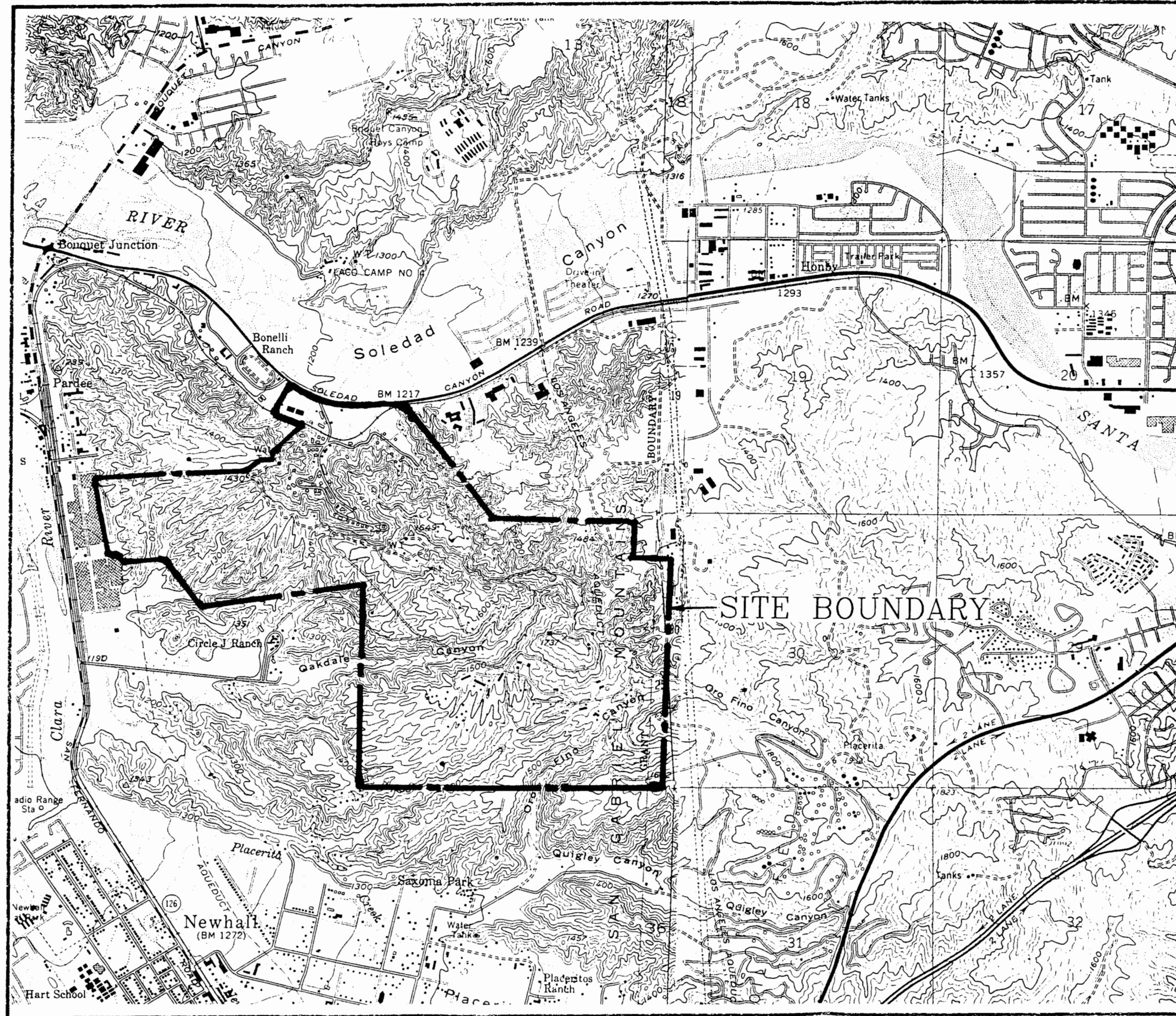
TABLE 3

## BACKGROUND WATER QUALITY PARAMETERS

Well No.	Date Sampled	Gross Alpha (pCi/l)	Gross Beta (pCi/l)	Lead (mg/l)	Fluoride (mg/l)	Nitrate (mg/l)	Turbidity (NTUs)
Detection Limits				0.0002	0.1	0.4	0.2
MW-1	10/04/88	0.4 ± 2	0.7 ± 2	ND <sup>a</sup>	-- <sup>b</sup>	--	--
	01/27/93	0 ± 1	4 ± 2	ND	0.2	--	--
	06/09/93	0.4 ± 1	0.7 ± 2	ND	0.2	3.9	0.4
	07/14/93	2 ± 2	0 ± 2	ND	0.4	4.8	0.9
	08/11/93	1 ± 1	4 ± 4	ND	0.3	4.8	0.9
	09/22/93	--	--	--	--	--	0.5
	03/10/94	--	--	--	--	ND	--
	06/22/94	2 ± 2	4 ± 2	<0.0002	0.2	3.6	1.0
MW-3	10/04/88	0.7 ± 1	2 ± 3	<0.01	--	--	--
	01/27/93	0.8 ± 1	2 ± 2	ND	0.3	--	--
	06/09/93	2 ± 1	1 ± 2	ND	0.2	1.6	ND
	07/14/93	2 ± 2	1 ± 2	ND	0.3	2.1	ND
	08/11/93	4 ± 2	3 ± 4	ND	0.2	2.2	0.3
	09/22/93	--	--	--	--	--	ND
	03/10/94	--	--	--	--	1.4	--
	06/22/94	1.0 ± 1	2 ± 2	4.9	0.2	3.6	0.3
MW-5 <sup>b</sup>	06/22/94	1.0 ± 1	3 ± 2	<0.0002	0.2	3.6	0.9
MW-6 <sup>b</sup>	06/22/94	0.1 ± 1	2 ± 2	<0.0002	0.2	3.8	0.8
MW-10 <sup>b</sup>	06/22/94	0.4 ± 1	4 ± 2	<0.0002	0.2	3.7	0.8

<sup>a</sup>Sample was not taken.

<sup>b</sup>Samples collected from monitoring wells MW-5, MW-6, and MW-7 during the twenty-third sampling event were analyzed for the background water quality parameters because of a repeated tolerance interval exceedence for sodium during previous sampling events.



# EXPLANATION:

----- Approximate Site Location Boundary

## General Notes

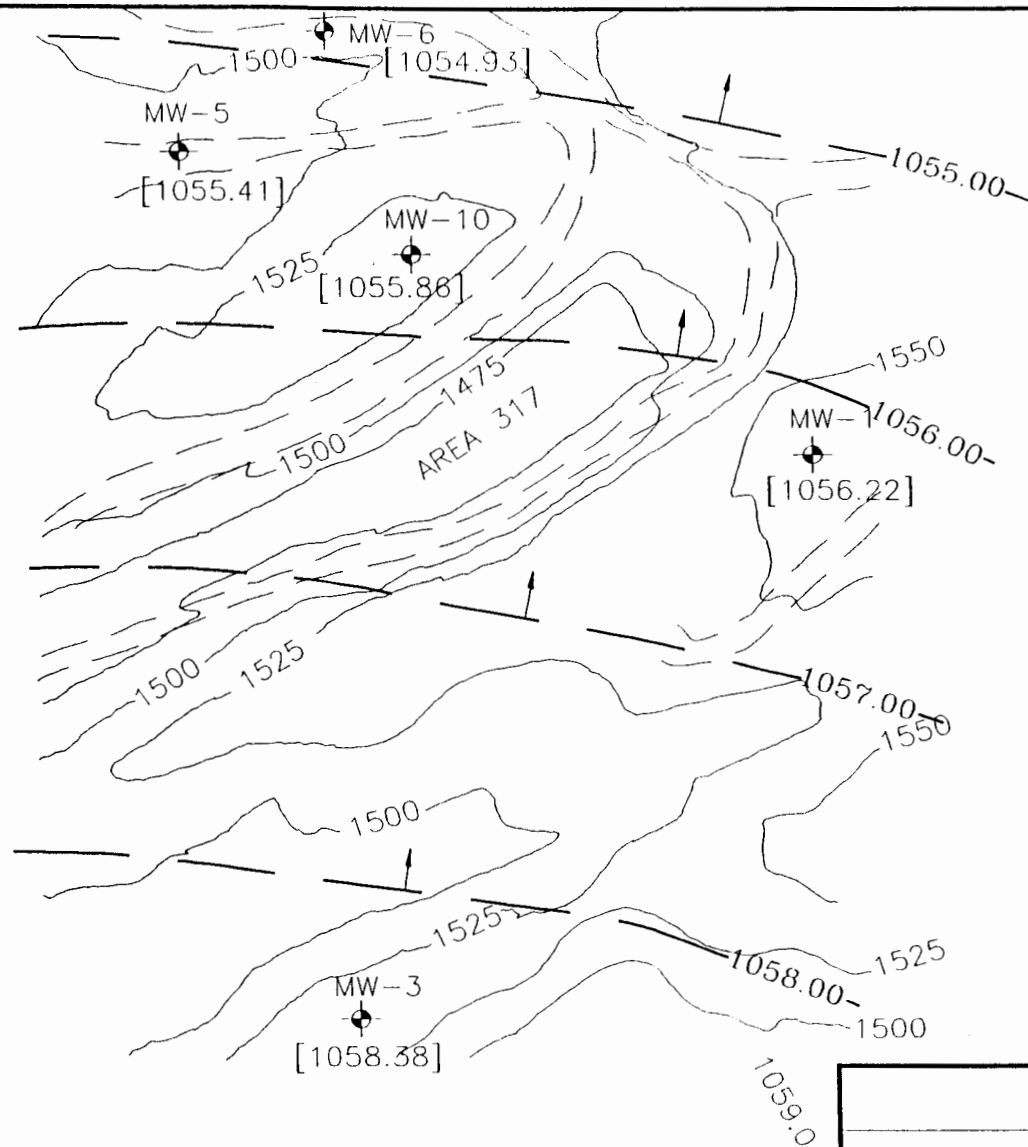
Base Map from U.S.G.S.  
7.5 Minute Topographics  
Mint Canyon, California  
Photorevised 1988  
And Newhall, California  
Photorevised 1988



0 2,000 4,000  
Approximate Scale  
(in feet)

**FIGURE 1**  
**SITE LOCATION MAP**  
WHITTAKER CORPORATION, BERMITE DIVISION  
22116 WEST SOLEDAD CANYON ROAD  
SANTA CLARITA, CALIFORNIA

Project No. 21001.44	Drawn DA	Acton • Mickelson • van Dam, Inc. Consulting Scientists, Engineers, and Geologists 4511 Golden Foothill Parkway, #1 El Dorado Hills, California 95762 (916) 939-7550
File No. FIG3-1	Prepared BLW	
Revision	Reviewed	



## LEGEND




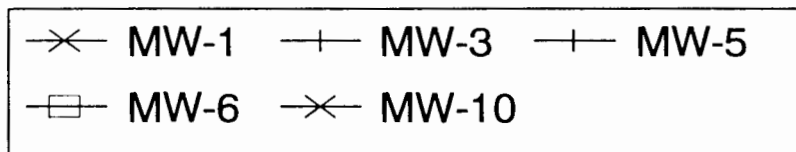
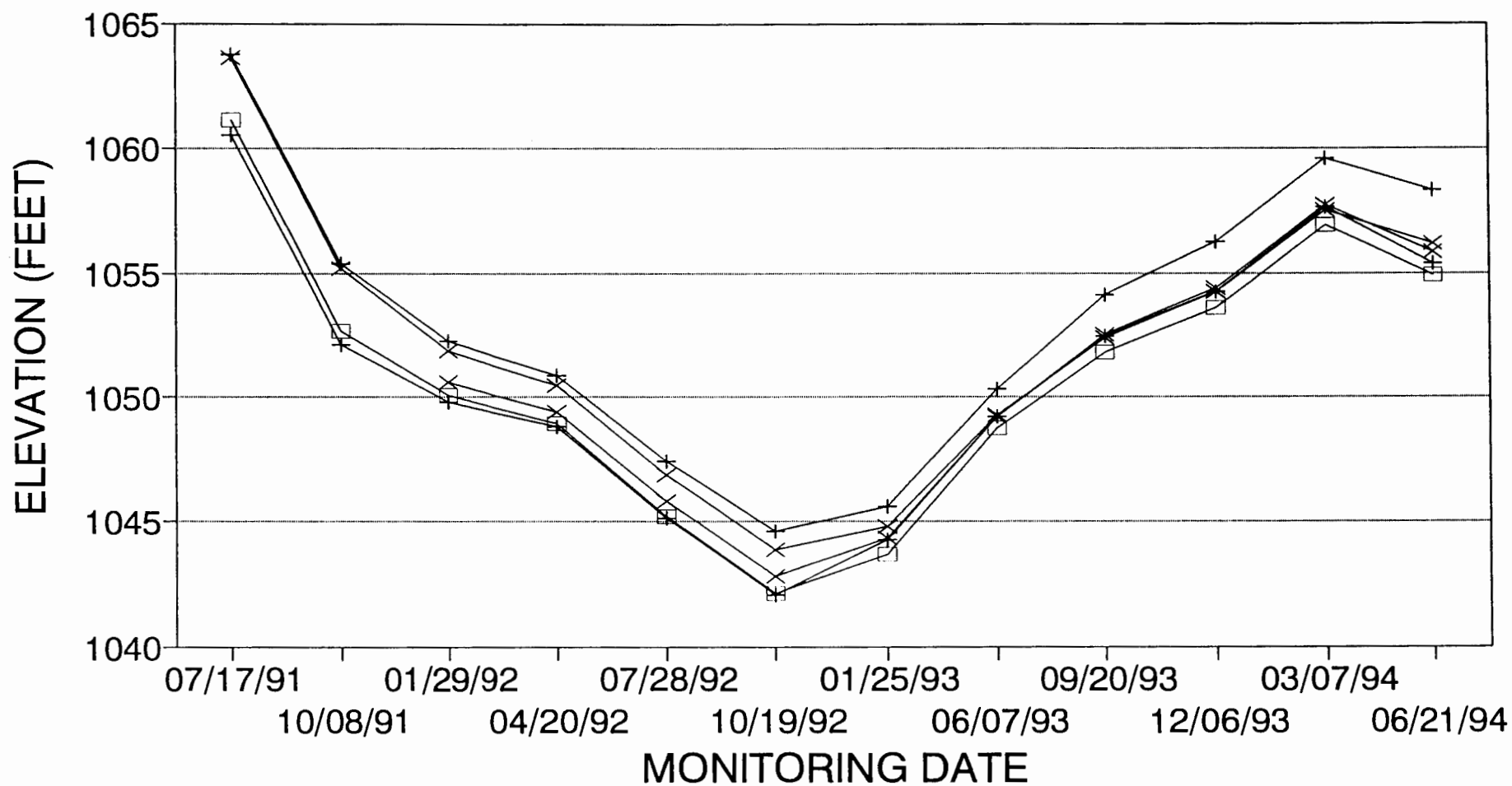
-  MW-1 MONITORING WELL LOCATION  
 [1056.22] GROUND WATER ELEVATION IN FEET  
 RELATIVE TO MEAN SEA LEVEL  
 1057.0 ESTIMATED GROUND WATER CONTOUR IN FEET  
 RELATIVE TO MEAN SEA LEVEL  
 1057.0 ESTIMATED GROUND WATER FLOW DIRECTION

FIGURE 2

AREA 317 GROUND WATER MONITORING WELL LOCATIONS  
 AND ESTIMATED GROUND WATER FLOW DIRECTION (06-21-94)  
 WHITTAKER CORPORATION, BERMITE DIVISION  
 22116 WEST SOLEDAD CANYON ROAD, SANTA CLARITA, CALIFORNIA

Project No.	Drawn	Acton • Mickelson • van Dam, Inc. Consulting Scientists, Engineers, and Geologists 4511 Golden Foothill Parkway, #1 El Dorado Hills, California 95762 (916) 939-7550
21001.48	CCB	
File No.	Prepared	
OM64WTC2	LGP	
Revision	Reviewed	
22		

**FIGURE 3**  
**RCRA GROUND WATER MONITORING WELLS**  
**POTENTIOMETRIC SURFACE ELEVATIONS**



**APPENDIX A**  
**DOCUMENT SUBMITTAL CHRONOLOGY**

## **APPENDIX A**

### **DOCUMENT SUBMITTAL CHRONOLOGY**

The following documents have been submitted to Cal-EPA and U.S. EPA, Region IX, in fulfillment of the Closure Plan regarding ground water monitoring at Areas 317 and 342:

- Whittaker Corporation, Bermite Division, Santa Clarita, CA CAD064573108, Facility Closure Plan Modifications, April 1987.
- Revised Ground Water Monitoring Plan for the 317/342 Area, October 8, 1987.
- Proposed Interim Status Ground Water Monitoring Sampling and Analysis Program, December 1987.
- Documentation Report--Construction and Development of Wells for Ground Water Monitoring of the 342 and 317 Areas, February 1988.
- Verification Sampling Results at Selected RCRA Units, March 1988.
- RCRA Ground Water Monitoring System--Proposed Final Configuration, May 1988.
- Ground Water Sampling and Analysis Plan, August 1988.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 1, December 1988.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 2, March 1989.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 3, July 1989.
- Specific Plan for a Ground Water Quality Assessment Program, June 1989.
- Interim Response Action Plan, 317 Area Soil and Ground Water Remediation, June 1989.
- Site Ground Water Sampling and Analysis Plan, Appendix IV of 40 CFR 264.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 4, September 1989.

- Statistical Analysis--Well MW-2 Versus MW-1 and MW-3, October 1989.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 5, March 1990.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 6, May 1990.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 7, June 1990.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 8, October 1990.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 9, January 1991.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 10, April 1991.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 11, July 1991.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 12, October 1991.
- Specific Plan for a Ground Water Quality Assessment Program for the 317 Surface Impoundment Area.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 13, January 1992.
- Area 317 RCRA Quarterly Ground Water Quality Monitoring Report No. 14 and Report of Monitoring Well MW-10 Installation, January through March 1992.
- Area 317 RCRA Quarterly Ground Water Quality Monitoring Report No. 15, April through June 1992.
- Area 317 RCRA Quarterly Ground Water Quality Monitoring Report No. 16, July through September 1992.
- Water Quality Monitoring and Response Plan for the Interim Status Area 317 Surface Impoundment, October 1992.
- Area 317 RCRA Quarterly Ground Water Quality Monitoring Report No. 17, October through December 1992.
- Area 317 RCRA Quarterly Ground Water Monitoring Report No. 18, January through March 1993.
- Area 317 RCRA Quarterly Ground Water Monitoring Report No. 19, April through June 1993.

- Area 317 RCRA Quarterly Ground Water Monitoring Report No. 20, July through September 1993.
- Area 317 RCRA Quarterly Ground Water Monitoring Report No. 21, October through December 1993.
- Area 317 RCRA Quarterly Ground Water Monitoring Report No. 22, January through March 1994.



**APPENDIX B**

**GROUND WATER SAMPLING PROCEDURES**

## **APPENDIX B**

### **GROUND WATER SAMPLING PROCEDURES**

On June 21, 1994, initial depth to water measurements were collected prior to the onset of monitoring well evacuation activities. Operation of the pumps in monitoring wells MW-1, MW-3, MW-5, MW-6, and MW-10 was then initiated to evacuate stagnant water. Pumping durations to evacuate these five monitoring wells are summarized in Table B-1. Prior to sample collection, the pumping rate for each monitoring well was reduced to approximately 100 milliliters per minute (ml/min) in a 1/4-inch-diameter tube.

In accordance with the "Ground Water Sampling and Analysis Plan," dated August 1988, evacuated ground water from monitoring wells MW-1, MW-3, MW-5, MW-6, and MW-10 was discharged to the ground surface, downgradient from each monitoring well.

#### **Well Stabilization**

Well stabilization measurements were periodically collected after well evacuation activities were initiated. Stabilization measurements for pH, temperature, turbidity, and specific conductance were taken three times prior to sampling of each well to increase the likelihood that representative ground water samples were collected. Table B-2 summarizes the results of the stabilization tests. As shown in Table B-2, the reported measurements in each monitoring well indicated a relatively stable condition prior to sampling.

#### **Sample Containers**

Sample containers used for the collection of ground water samples were supplied by Eagle Picher Environmental Services and I-Chem, Inc. The sample containers used were precleaned and sealed at these facilities and are statistically certified as clean and free of volatile organic and metal compounds. (Certificates of Analysis for the sample containers used during the quarterly ground water sampling event are provided in this appendix.) Table B-3 lists the laboratory analytical methods, sample volume, and containers used for this quarterly ground water sampling event.

#### **Sample Labeling**

Sample identification labels were filled out in the field at the time of sample collection in accordance with the "Ground Water Sampling and Analysis Plan," dated August 1988. A sample identification system was established to clearly and properly label samples. Each label identifies the monitoring well number, analytical parameter required, quarterly sampling event number, and replicate number (if required). A legend is provided in Table B-4 outlining the labeling system.

## **Sample Collection**

### Sampling Volumetric Flow Rate

A Teflon sampling valve and stem were installed into the invert of the well discharge pipe of each monitoring well to minimize aeration and agitation of the collected ground water sample. The flow rates in the monitoring wells were reduced to approximately 100 milliliters/minute (ml/min) in a 1/4-inch-diameter tube prior to sampling.

### Order of Sample Collection

The ground water at each monitoring well was sampled for selected analytical parameters in the same order. This order is presented in Table B-5.

### Field Sample Preservation

Ground water samples collected for TOC and TOX were preserved by adjusting the pH. A 50 percent sulfuric acid solution was added to the sample containers after filtration of the ground water sample to lower the pH. The pH of the water sample was monitored with an electric pH meter as the acid was added with a small pipette. Acid was added until a pH of less than 2 was achieved.

Following collection, labeling, and sealing, each individual ground water sample was placed in a refrigerator and locked. Samples were placed on ice in a cooler following collection and delivered to the laboratory on June 22, 1994.

### Field and Trip Sample Blanks

During each quarterly sampling event, field and trip blanks were analyzed for TCEs, TOCs, and TOXs in accordance with the "Ground Water Sampling and Analysis Plan," dated August 1988.

The trip blanks were prepared in the laboratory, transferred to the site in coolers, stored in the refrigerator overnight, transferred to each sampling location during sampling activities, and stored with collected ground water samples throughout the sampling event and delivered to the laboratory.

The field blanks are prepared in the field using water provided by the analytical laboratory. These field blanks, once prepared, were stored with the ground water samples throughout the sampling event and delivered to the laboratory.

## **FIELD QA/QC**

### **Washing of Field Test Equipment**

To minimize the potential for cross-contamination between well samples, field equipment used during sampling activities was decontaminated between each well. Decontamination procedures involved cleaning and rinsing with deionized water before and after each sample was collected at each well. The mercury thermometer, pH probe, sulfuric acid eye droppers, turbidity meter, specific conductance probe, and the water level meter probe were all decontaminated between samples.

Unused sampling gloves were worn by sampling personnel prior to sealing the sample containers with the chain-of-custody seals.

### **Sample Container Labeling and Seals**

As previously stated, the sample containers were labeled in the field as each sample was collected. A unique sample identification number was assigned to each ground water sample. Chain-of-custody seals were then placed on the sample containers after sampling and labeling. The ground water samples were placed on ice in a cooler, and the cooler was sealed with chain-of-custody seals prior to shipment to the laboratory.

### **Chain-of-Custody and Sample Analysis Request Forms**

Chain-of-custody forms were filled out at the time of sample collection and were kept with the samples until they were delivered to the laboratory. Copies of the signed chain-of-custody forms are provided in Appendix C.

Sample analysis request forms were also filled out at the time of sample collection and were kept with the samples until they were delivered to the laboratory. Sample analysis request forms are used to inform the laboratory of the analysis to run on each ground water sample. Copies of the sample analysis request forms are provided in Appendix D.

### **Delivery of Samples to Laboratory**

Ground water samples were delivered to FGL in Santa Paula, California, by personnel of Whittaker after sampling activities were completed. FGL is approximately 45 minutes by car from the site. Maximum and minimum thermometers were placed in each cooler for temperature verification. Upon arrival at the laboratory, the temperature was recorded on the sample analysis request form. The temperature of the samples was kept below 4° C.

**Security**

Security measures were implemented to minimize the likelihood that unauthorized personnel had access to the wells or ground water samples before, during, or after sampling activities. The site is fenced-in with locking gates and has 24-hour security personnel present. Each monitoring well has a locking cap to deter unauthorized access to the well. The ground water samples were handled by Whittaker personnel only during sampling activities and delivery to FGL.

TABLE B-1

AREA 317 WELL EVACUATION  
BERMITE DIVISION, WHITTAKER CORPORATION

Well Number	Date Pump Started	Evacuation	Sampling <sup>a</sup>	Time and Date of Sample Collection
		Approximate Duration of Pumping (hours)	Duration of Pumping (minutes)	
MW-1	6/21/94	26	15	1000 (6/22/94)
MW-3	6/21/94	26	20	1020 (6/22/94)
MW-5	6/21/94	27	19	1045 (6/22/94)
MW-6	6/21/94	27	20	1110 (6/22/94)
MW-10	6/21/94	28	21	1135 (6/22/94)

<sup>a</sup>Flow rate from wells was reduced prior to sampling. Actual sample extraction flow rate for all wells approximately 100 milliliter/minute in a 1/4-inch pipe.

TABLE B-2

WELL STABILIZATION TESTS  
BERMITE DIVISION, WHITTAKER CORPORATION

Well	Turbidity (NTUs) <sup>a</sup>	Temperature (°C.)	pH	Specific Conductance (μmhos) <sup>b</sup> /cm <sup>2</sup>	Time and Date
MW-1	4.38	22.4	7.09	736	1235 (6/21/94)
	3.92	23.6	7.88	730	1605 (6/21/94)
	2.62	23.1	7.57	728	0735 (6/22/94)
MW-3	1.32	24.2	7.41	629	1240 (6/21/94)
	1.35	23.9	7.83	628	1610 (6/21/94)
	1.20	23.7	7.76	632	0740 (6/22/94)
MW-5	2.60	23.4	7.71	531	1245 (6/21/94)
	2.58	24.2	7.92	544	1615 (6/21/94)
	2.16	24.3	7.81	540	0745 (6/22/94)
MW-6	3.20	23.6	7.70	554	1250 (6/21/94)
	2.44	24.2	7.90	547	1620 (6/21/94)
	1.90	24.2	7.88	552	0750 (6/22/94)
MW-10	2.62	23.5	7.66	616	1255 (6/21/94)
	2.24	23.8	7.85	607	1625 (6/21/94)
	1.89	23.9	7.97	602	0755 (6/22/94)

<sup>a</sup>NTUs - nephelometric turbidity units.

<sup>b</sup>μmhos - micromhos.

TABLE B-3

LABORATORY ANALYTICAL METHODS AND SAMPLE VOLUME  
AND CONTAINER REQUIREMENTS  
AREA 317 GROUND WATER MONITORING WELLS  
WHITTAKER CORPORATION, BERMITE DIVISION

Constituent	Analytical Method	Sample Volume (milliliters)	Container Type
<b>Ground Water Monitoring Parameters</b>			
pH	EPA 150.1	50	Plastic/glass
Specific Conductance	EPA 120.1	100	Plastic
Total Organic Carbon	EPA 415.1	250	Amber glass-TFE cap
Total Organic Halogen	EPA 9020	250	Amber glass-TFE cap
Trichloroethylene	EPA 601	3 x 40	Amber glass-TFE cap
Sulfate	EPA 300.0	200	Plastic/glass
Sodium	EPA 200.7	200	Plastic
Iron	EPA 200.7	200	Plastic
Manganese	EPA 200.7	200	Plastic
Chloride	EPA 300.0	100	Plastic/glass
<b>Background Water Quality Parameters</b>			
Fluoride	EPA 340.2	100	Plastic/glass
Lead	EPA 200.8	100	Plastic
Gross Alpha	EPA 900.0	200	Plastic
Gross Beta	EPA 900.0	200	Plastic
Nitrate	EPA 353.2	200	Plastic
Turbidity	EPA 180.1	250	Amber glass



TABLE B-4

AREA 317  
KEY TO ANALYSIS DESIGNATION LABELS ON SAMPLE CONTAINERS  
BERMITE DIVISION, WHITTAKER CORPORATION

Analysis Designation	Parameter(s) to be Analyzed
A	pH Specific Conductance (temperature corrected)
B	Total Organic Carbon (TOC)
C	Total Organic Halogen (TOX)
E	Gross alpha, Gross Beta
H	Sulfate, Chloride
N	Fluoride
O	Trichloroethene (TCE)
R	Sodium, Iron, Manganese
S	Nitrate
T	Turbidity
V	Lead

Each sample container was labeled with a unique sample number. The form of each label was as follows:

Well I.D./Analysis Designation/Sample Event No.

Where:

Well I.D. = MW-1, MW-3, MW-4, MW-5, MW-6, or MW-10.

Analysis Designation = A through V according to above table.

Sample Event No. = 1 through present event number.

TABLE B-5

ORDER OF SAMPLE COLLECTION  
BERMITE DIVISION, WHITTAKER CORPORATION

1	pH, Specific Conductance
2	Total Organic Carbon (TOC)
3	Total Organic Halogen (TOX)
4	Gross Alpha, Gross Beta
5	Sulfate, Chloride
6	Trichloroethene (TCE)
7	Sodium, Iron, Manganese
8	Nitrate
9	Turbidity
10	Lead
11	Fluoride



This is your Certificate of Analysis for I-CHEM SUPERFUND-ANALYZED™ product which has been prepared in accordance with I-CHEM Performance-Based Specifications. This product meets or exceeds analyte specifications established in the U.S. EPA "Specifications and Guidance for Contaminant-Free Sample Containers" for use in Superfund and other hazardous waste programs.

## Group 1. Glass and HDPE Sample Containers for use in the analysis of Metals

Analyte	Detection Limit (ug/L)	Analyte	Detection Limit (ug/L)	Analyte	Detection Limit (ug/L)
Aluminum	< 80	Cobalt	< 10	Selenium	< 2
Antimony	< 5	Copper	< 10	Silver	< 5
Arsenic	< 2	Iron	< 50	Sodium	< 5000
Barium	< 20	Lead	< 2	Sodium (HDPE)	< 100
Barium (Amber HDPE)	< 50	Magnesium	< 100	Thallium	< 5
Beryllium	< 0.5	Manganese	< 10	Vanadium	< 10
Cadmium	< 1	Mercury	< 0.2	Zinc	< 10
Calcium	< 500	Nickel	< 20	Zinc (Amber HDPE)	< 500
Calcium (HDPE)	< 100	Potassium	< 750		
Chromium	< 10	Potassium (HDPE)	< 100		


## Group 2. Glass Sample Containers for use in the analysis of Semivolatiles, Pesticides, and PCBs

Compound	Quantitation Limit(ug/L)	Compound	Quantitation Limit(ug/L)	Compound	Quantitation Limit(ug/L)
Acenaphthene	< 5	Acenaphthylene	< 5	Anthracene	< 5
Benzo(a)anthracene	< 5	Benzo(a)pyrene	< 5	Benzo(b)fluoranthene	< 5
Benzo(k)fluoranthene	< 5	Benzo(g,h,i)perylene	< 5	Benzoic Acid	< 20
Benzyl Alcohol	< 5	4-Bromophenyl-phenylether	< 5	Butylbenzylphthalate	< 5
4-Chloroaniline	< 5	4-Chloro-3-methylphenol	< 5	bis-(2-Chloroethoxy)methane	< 5
bis-(2-Chloroethyl)ether	< 5	bis-(2-Chloroisopropyl)ether	< 5	2-Chloronaphthalene	< 5
2-Chlorophenol	< 5	4-Chlorophenyl-phenylether	< 5	Chrysene	< 5
Di-n-butylphthalate	< 5	Di-n-octylphthalate	< 5	Dibenzo(a,h)anthracene	< 5
Dibenzofuran	< 5	1,2-Dichlorobenzene	< 5	1,4-Dichlorobenzene	< 5
1,3-Dichlorobenzene	< 5	3,3'-Dichlorobenzidine	< 5	2,4-Dichlorophenol	< 5
Diethylphthalate	< 5	Dimethylphthalate	< 5	2,4-Dimethylphenol	< 5
4,6-Dinitro-2-methylphenol	< 20	2,4-Dinitrophenol	< 20	2,4-Dinitrotoluene	< 5
2,6-Dinitrotoluene	< 5	bis-(2-Ethylhexyl)phthalate	< 5	Fluoranthene	< 5
Fluorene	< 5	Hexachlorobenzene	< 5	Hexachlorobutadiene	< 5
Hexachlorocyclopentadiene	< 5	Hexachloroethane	< 5	Indeno(1,2,3-cd)pyrene	< 5
Isophorone	< 5	2-Methylnaphthalene	< 5	2-Methylphenol	< 5
4-Methylphenol	< 5	2-Nitroaniline	< 20	3-Nitroaniline	< 20
4-Nitroaniline	< 20	N-Nitroso-di-n-propylamine	< 5	N-Nitrosodimethylamine	< 5
N-Nitrosodiphenylamine	< 5	Naphthalene	< 5	Nitrobenzene	< 5
2-Nitrophenol	< 5	4-Nitrophenol	< 20	Pentachlorophenol	< 20
Phenanthrene	< 5	Phenol	< 5	Pyrene	< 5
1,2,4-Trichlorobenzene	< 5	2,4,5-Trichlorophenol	< 20	2,4,6-Trichlorophenol	< 5
Azobenzene	< 5	Carbazole	< 5	Aldrin	< 0.01
4,4'-DDD	< 0.02	Endosulfan II	< 0.02	Alpha-BHC	< 0.01
4,4'-DDE	< 0.02	Endosulfan Sulfate	< 0.02	Beta-BHC	< 0.01
4,4'-DDT	< 0.02	Endrin	< 0.02	Delta-BHC	< 0.01
Dieldrin	< 0.02	Endrin Aldehyde	< 0.02	Gamma-BHC	< 0.01
Endosulfan I	< 0.01	Heptachlor	< 0.01	Heptachlor Epoxide	< 0.01
Methoxychlor	< 0.10	Endrin Ketone	< 0.02	Alpha-Chlordane	< 0.01
Gamma-Chlordane	< 0.01	Toxaphene	< 0.30	Aroclor-1016	< 0.20
Aroclor-1221	< 0.20	Aroclor-1232	< 0.20	Aroclor-1242	< 0.20
Aroclor-1248	< 0.20	Aroclor-1254	< 0.20	Aroclor-1260	< 0.20
Aroclor-1262	< 0.20	Aroclor-1268	< 0.20		

## Group 3. Glass Sample Containers for use in the analysis of Volatile Organics

Compound	Quantitation Limit(ug/L)	Compound	Quantitation Limit(ug/L)	Compound	Quantitation Limit(ug/L)
Acetone	< 5	1,3-Dichloropropane	< 1	Benzene	< 1
2,2-Dichloropropane	< 1	Bromobenzene	< 1	1,2-Dichloropropane	< 1
Bromodichloromethane	< 1	trans-1,3-Dichloropropene	< 1	Bromoform	< 1
cis-1,3-Dichloropropene	< 1	Bromomethane	< 1	1,1-Dichloropropene	< 1
2-Butanone	< 5	Ethylbenzene	< 1	tert-Butylbenzene	< 1
Hexachlorobutadiene	< 1	sec-Butylbenzene	< 1	2-Hexanone	< 5
n-Butylbenzene	< 1	Isopropylbenzene	< 1	Carbon Disulfide	< 1
p-Isopropyltoluene	< 1	Carbon Tetrachloride	< 1	4-Methyl-2-pentanone	< 5
Chlorobenzene	< 1	Methylene Chloride	< 2	Chloroethane	< 1
Naphthalene	< 1	Chloroform	< 1	n-Propylbenzene	< 1
Chloromethane	< 1	Styrene	< 1	2 & 4 Chlorotoluene	< 1
1,1,2,2-Tetrachloroethane	< 1	1,2-Dibromo-3-chloropropane	< 1	Tetrachloroethene	< 1
Dibromochloromethane	< 1	Toluene	< 1	1,2-Dibromoethane (EDB)	< 1
1,2,3-Trichlorobenzene	< 1	Dibromomethane	< 1	1,2,4-Trichlorobenzene	< 1
1,4-Dichlorobenzene	< 1	1,1,2-Trichloroethane	< 1	1,3-Dichlorobenzene	< 1
1,1,1-Trichloroethane	< 1	1,2-Dichlorobenzene	< 1	Trichloroethene	< 1
Dichlorodifluoromethane	< 1	Trichlorofluoromethane	< 1	1,2-Dichloroethane	< 1
1,2,3-Trichloropropane	< 1	1,1-Dichloroethane	< 1		
trans-1,2-Dichloroethene	< 1	1,3,5-Trimethylbenzene	< 1		
Vinyl Acetate	< 5	1,1-Dichloroethene	< 1		
Xylenes (total)	< 1	1,2,4-Trimethylbenzene	< 1		
Vinyl Chloride	< 1	cis-1,2-Dichloroethene	< 1		

Please keep this certificate for your records and to facilitate any necessary correspondence. If additional information is required, contact our Technical Service Department at (800) 443-1689 or (800) 262-5006 inside California.

  
Randy E. Benson  
Corporate Quality Assurance Manager

**APPENDIX C**  
**CHAIN-OF-CUSTODY FORMS**

N:

FIELD COORDINATOR

GLEN ABDUN-NUR

## CHAIN OF CUSTODY RECORD

PROJ. NO.		PROJECT NAME					NUMBER OF CONTAINERS	PRESERVED WITH H2SO4 42								REMARKS
85-01.4		317 AREA BERMITE 23RD. QTR. WATER SAMPLING														
SAMPLERS (Signature)																
STA NO	DATE	TIME	COMP	GRAB	STATION LOCATION											
MW1/A/23	6/22/94	1000		X	MONITORING WELL 1	1										ANALYSIS TYPE A
MW1/B/23	11	1002		X	"	1	X									" B
MW1/C/23	11	1004		X	"	1	X									" C
MW1/E/23	11	1006		X	"	1										" E
MW1/H/23	11	1007		X	"	1										" H
MW1/O/23	11	1008		X	"	3										" O
MW1/R/23	11	1009		X	"	1										" R
MW1/S/23	11	1010		X	"	1										" S
MW1/T/23	11	1011		X	"	1										" T
MW1/U/23	11	1013		X	"	1										" U
MW1/V/23	11	1015		X	"	1										" N
Relinquished by: (Signature)		Date	Time	Received by: (Signature)		Relinquished by: (Signature)		Date	Time	Received by: (Signature)						
		6-22-94	12:25					6-22-94	1326							
Relinquished by: (Signature)		Date	Time	Received by: (Signature)		Relinquished by: (Signature)		Date	Time	Received by: (Signature)						
Relinquished by: (Signature)		Date	Time	Received for Laboratory by: (Signature)		Date	Time	Remarks								

N:

## CHAIN OF CUSTODY RECORD

FIELD COORDINATOR

GLEN ABDUN-NUR

PROJ. NO.		PROJECT NAME					NUMBER OF CONTAINERS	PRESERVED WITH H <sub>2</sub> SO <sub>4</sub> 2								REMARKS
85-01-4		317 AREA BERMITE 23RD. QTR. WATER SAMPLING														
SAMPLERS (Signature)																
STA NO	DATE	TIME	COMP	GRAB	STATION LOCATION											
MW3/A/23	6/22/94	1020		X	MONITORING WELL 3	1										ANALYSIS TYPE A
MW3/B/23	"	1022		X	"	1	X									" B
MW3/C/23	"	1024		X	"	1	X									" C
MW3/E/23	"	1026		X	"	1										" E
MW3/H/23	"	1028		X	"	1										" H
MW3/O/23	"	1030		X	"	3										" O
MW3/R/23	"	1033		X	"	1										" R
MW3/S/23	"	1036		X	"	1										" S
MW3/T/23	"	1037		X	"	1										" T
MW3/U/23	"	1038		X	"	1										" U
MW3/V/23	"	1040		X	"	1										" N
Relinquished by: (Signature)		Date	Time	Received by: (Signature)		Relinquished by: (Signature)		Date	Time	Received by: (Signature)						
		6-22-94	12:25					6/22/94	13:26							
Relinquished by: (Signature)		Date	Time	Received by: (Signature)		Relinquished by: (Signature)		Date	Time	Received by: (Signature)						
Relinquished by: (Signature)		Date	Time	Received for Laboratory by: (Signature)		Date	Time	Remarks								

N:

FIELD COORDINATOR

GLEN ABDUN-NUR

## CHAIN OF CUSTODY RECORD

PROJ. NO.		PROJECT NAME					NUMBER OF CONTAINERS	PRESERVED WITH H <sub>2</sub> SO <sub>4</sub> 2							REMARKS
85-01-4		317 AREA BERMITE 23RD. QTR. WATER SAMPLING													
SAMPLERS (Signature)															
STA NO	DATE	TIME	COMP	GRAB	STATION LOCATION										
MW5/A/23	6/22/94	1045		X	MONITORING WELL 5	1								ANALYSIS TYPE A	
MW5/B/23	"	1047		X	"	1	X							" B	
MW5/C/23	"	1049		X	"	1	X							" C	
MW5/D/23	"	1050		X	"	1								" E	
MW5/H/23	"	1052		X	"	1								" H	
MW5/I/23	"	1054		X	"	3								" O	
MW5/R/23	"	1058		X	"	1								" R	
MW5/S/23	"	1059		X	"	1								" S	
MW5/T/23	"	1100		X	"	1								" T	
MW5/U/23	"	1102		X	"	1								" U	
MW5/V/23	"	1104		X	"	1								" N	
Relinquished by: (Signature)		Date	Time	Received by: (Signature)		Relinquished by: (Signature)		Date	Time	Received by: (Signature)					
		6-22-94	12:30					6/22/94	1326						
Relinquished by: (Signature)		Date	Time	Received by: (Signature)		Relinquished by: (Signature)		Date	Time	Received by: (Signature)					
Relinquished by: (Signature)		Date	Time	Received for Laboratory by: (Signature)		Date	Time	Remarks							



N:

FIELD COORDINATOR

GLEN ABDUN-NUR


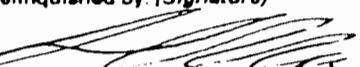


## CHAIN OF CUSTODY RECORD

PROJ. NO.		PROJECT NAME					NUMBER OF CONTAINERS	PRESERVED WITH H <sub>2</sub> SO <sub>4</sub> :K <sub>2</sub>								REMARKS
85-01.4		317 AREA BERMITE 23RD. QTR. WATER SAMPLING														
SAMPLERS (Signature)																
STA NO	DATE	TIME	COMP	GRAB	STATION LOCATION											
mw6/A/23	6/22/94	11:00		X	MONITORING WELL 6	1										ANALYSIS TYPE A
mw6/B/23	11	11:02		X	"	1	X									" B
mw6/C/23	11	11:04		X	"	1	X									" C
mw6/D/23	11	11:06		X	"	1										" E
mw6/E/23	11	11:08		X	"	1										" H
mw6/F/23	11	11:20		X	"	3										" O
mw6/G/23	11	11:24		X	"	1										" R
mw6/H/23	11	11:25		X	"	1										" S
mw6/I/23	11	11:26		X	"	1										" T
mw6/J/23	11	11:28		X	"	1										" U
mw6/K/23	11	11:30		X	"	1										" N
Relinquished by: (Signature)		Date	Time	Received by: (Signature)		Relinquished by: (Signature)		Date	Time	Received by: (Signature)						
		6-22-94	12:30					6/22/94	1326							
Relinquished by: (Signature)		Date	Time	Received by: (Signature)		Relinquished by: (Signature)		Date	Time	Received by: (Signature)						
Relinquished by: (Signature)		Date	Time	Received for Laboratory by: (Signature)		Date	Time	Remarks								

N.

CHAIN OF CUSTODY RECORD												FIELD COORDINATOR		
PROJ. NO.		PROJECT NAME					NUMBER OF CONTAINERS	PRESERVED WITH H 350452						REMARKS
85-01-4		317 AREA BERMITE 23RD. QTR. WATER SAMPLING												
SAMPLERS (Signature)														
STA NO.	DATE	TIME	COMP	GRAB	STATION LOCATION									
NW19/12/23	6/22/24	1135		X	MONITORING WELL 10	1							ANALYSIS TYPE A	
NW19/12/23	11	1137		X	11	1	X						B	
NW19/12/23	11	1139		X	11	1	X						C	
NW19/12/23	11	1141		X	11	1							E	
NW19/12/23	11	1143		X	11	1							H	
NW19/12/23	11	1145		X	11	3							G	
NW19/12/23	11	1150		X	11	1							R	
NW19/12/23	11	1152		X	11	1							S	
NW19/12/23	11	1153		X	11	1							T	
NW19/12/23	11	1154		X	11	1							U	
NW19/12/23	11	1156		X	11	1							N	
Relinquished by: (Signature)		Date	Time	Received by: (Signature)		Relinquished by: (Signature)		Date	Time	Received by: (Signature)				
		6-22-24	12:30					6/22/24	1326					
Relinquished by: (Signature)		Date	Time	Received by: (Signature)		Relinquished by: (Signature)		Date	Time	Received by: (Signature)				
Relinquished by: (Signature)		Date	Time	Received for Laboratory by: (Signature)		Date	Time	Remarks						

N.

CHAIN OF CUSTODY RECORD												FIELD COORDINATOR		
PROJ. NO.		PROJECT NAME					NUMBER OF CONTAINERS	PRESERVED WITH H <sub>2</sub> SO <sub>4</sub> & 2						REMARKS
85-01.4		317 AREA BERMITE 23RD QTR. WATER SAMPLING												
SAMPLERS (Signature)														
STA NO.	DATE	TIME	COMP	GRAB	STATION LOCATION									
W5/6/23 1A	6/22/94	1105		X	MONITORING WELL 5	1	X						ANALYST TYPE B	
W5/6/23 1A	11	1105		X	"	1	X						" C	
W5/6/23 1A	11	1105		X	"	3							" O	
W6/8/23 1A	11	1131		X	MONITORING WELL 6	1	X						" B	
W6/8/23 1A	11	1131		X	"	1	X						" C	
W6/8/23 1A	11	1132		X	"	3							" O	
Relinquished by: (Signature)		Date	Time	Received by: (Signature)		Relinquished by: (Signature)		Date	Time	Received by: (Signature)				
		6-22-94	12:30					6/22/94	1326	S Berrington				
Relinquished by: (Signature)		Date	Time	Received by: (Signature)		Relinquished by: (Signature)		Date	Time	Received by: (Signature)				
Relinquished by: (Signature)		Date	Time	Received for Laboratory by: (Signature)		Date	Time	Remarks						

**APPENDIX D**  
**SAMPLE ANALYSES REQUEST FORMS**

## SAMPLE ANALYSIS REQUEST

### Sampling Information

Project No. 85-01.4

Project Name: 317 AREA  
BERMITE 23RD QTR WATER SAMPL

Sampler Name: GLEADBURN-NR/TIM BRICKER

Tele. No. (805) 259-2241

Name of Person Receiving Samples: S Berrington

Date Samples Received: 6/22/94

Internal Temperature of Sample Container: 0

Notes on Samples:

### Analysis Required

[illegible]

### Sampling Information

Project Name: 317 AREA  
BERMITE 23RD QTR. WATER SAMPLE

Name of Person Receiving Samples: SBerrington

Date Samples Received: 6/22/94

Internal Temperature of Sample Container: ~~0~~

Notes on Samples: \_\_\_\_\_

[illegible]

## SAMPLE ANALYSIS REQUEST

### Sampling Information

Project No. 85-014

Project Name: 317 AREA  
BERMITE 23RD QTR WATER SAMPLING

Sampler Name: GLEADBUN-NUR/TIM BRICKER

Tele. No. (805) 259-2241

Name of Person Receiving Samples: S Berrington

Date Samples Received: 6/22/94

Internal Temperature of Sample Container:                     

**Notes on Samples:**

### Analysis Required

[illegible]

## SAMPLE ANALYSIS REQUEST

### Sampling Information

Project No. 85-014

Project Name: 317 AREA  
BERMITE 23RD QTR. WATER SAMPLIN

Sampler Name: GLEN ABOUN-NUR/TUN BRICKER Tele. No. (805) 259-2741

Name of Person Receiving Samples: S Berrington

Date Samples Received: 6/22/94

Internal Temperature of Sample Container: 0

Notes on Samples: \_\_\_\_\_

### Analysis Required

[illegible]



## SAMPLE ANALYSIS REQUEST

### Sampling Information

Project No. 85-014

Project Name: 317 AREA  
BERMITE 23RD QTR WATER SAMPLING

Sampler Name: GLENN BUN-NOR/TIM BRICKER

Tele. No. (805) 259-2241

Name of Person Receiving Samples: S Berrington

Date Samples Received: 6/22/94

**Internal Temperature of Sample Container:**

**Notes on Samples:**

### Analysis Required

[illegible]

## SAMPLE ANALYSIS REQUEST

### Sampling Information

Project No. 85-014

Project Name: BERMITE 23RD QTR. WATER SAMPLIN

**Sampler Name:** GLEN ABDON-NUR/TIM BRICKER **Tele. No.** (805) 259-2241

Name of Person Receiving Samples: S Berrington

Date Samples Received: 6/22/94

Internal Temperature of Sample Container: 0

Notes on Samples: \_\_\_\_\_

### Analysis Required

[illegible]

## SAMPLE ANALYSIS REQUEST

### Sampling Information

Project No. 85-014

Project Name: 317 AREA  
BERMITE 23RD. QTR WATER SAMPL.

Sampler Name: GLENN-BOWEN/TIM BRICKER

Tele. No. (805) 259-2241

Name of Person Receiving Samples: S. Berrington

Date Samples Received: 6/22/94

Internal Temperature of Sample Container: 0

Notes on Samples:

### Analysis Required

[illegible]

## SAMPLE ANALYSIS REQUEST

### Sampling Information

Project No. 85-01.4

Project Name: 317 AREA  
BERMITE 23RD QTR. WATER SAMPLIN

Sampler Name: GLEN ABDON-NUR/TIM BRICKER Tele. No. (805) 259-2741

Name of Person Receiving Samples: S Berrington

Date Samples Received: 6/22/94

Internal Temperature of Sample Container: 0

Notes on Samples: \_\_\_\_\_

### Analysis Required

[illegible]

## SAMPLE ANALYSIS REQUEST

### Sampling Information

Project No. 85-014

Project Name: 317 AREA  
BERMITE 23RD QTR WATER SAMPL.

Sampler Name: GLEADON-NUR/TIM BRICKER

Tele. No. (805) 259-2241

Name of Person Receiving Samples: S. Berrington

Date Samples Received: 6/22/94

Internal Temperature of Sample Container: 0

**Notes on Samples:**

### Analysis Required

[illegible]

## SAMPLE ANALYSIS REQUEST

### Sampling Information

Project No. 85-01.4

Project Name: 317 AREA  
BERMITE 23RD QTR. WATER SAMPLES

Sampler Name: GLEN ABDON-NUR/TIM BRICKER Tele. No. (805) 259-2741

Name of Person Receiving Samples: S Berrington

Date Samples Received: 6/22/94

Internal Temperature of Sample Container: 0

Notes on Samples: \_\_\_\_\_

### Analysis Required

[illegible]

## SAMPLE ANALYSIS REQUEST

### Sampling Information

Project No. 85-01.4

317 AREA  
Project Name: BERMITE 23RD. QTR. SAMPLING

**Sampler Name:** GLNABDUN-NUR/TIM BRICKER **Tele. No.** (805) 259-2241

Name of Person Receiving Samples: S. Berrington

Date Samples Received: 6/22/94

Internal Temperature of Sample Container: 0

Notes on Samples: \_\_\_\_\_

### Analysis Required

[illegible]

## **APPENDIX E**

### **FGL QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) PROGRAM**





# ENVIRONMENTAL

## Analytical Chemists

July 12, 1994

INORGANIC QA/QC Report for samples: 403651-403655

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

Constituent	BATCH ID	EPA Method	Units	BLANK QA/QC			CALIBRATION QA/QC					METHOD QA/QC							
				DLR	Result	NOTE	Type	Conc.	% REC	AR	NOTE	Type	Conc.	% REC	% REC	AR	% DIF	MAV	NOTE
Iron	12B	200.7	ug/L-mg/L	50	ND		LCS	1000	96.8	86-113		MS	556	103	81.9	75-125	2.0	20.	
Lead	52A	200.8	ug/L-mg/L	0.50	ND		LCS	50.0	102	75-125		MS	20.8	105	106	75-125	1.0	20.0	
Manganese	12B	200.7	ug/L-mg/L	30	ND		LCS	1000	98.0	90-109		MS	556	100	99.9	75-125	0.2	20.	
Sodium	12A1	200.7	mg/L	1.0	ND		LCS	100	101	75-125		MS	22.2	103	87.9	75-125	5.2	20.0	
Chloride	62A	300.0	mg/L	1.0	ND		CCV	101	99.2	93-110		MS	200	92.4	95.7	85-111	2.4	4.1	
	62B	300.0	mg/L	1.0	ND		CCV	101	101	93-110		MS	200	96.2	98.5	85-111	2.0	4.1	
Conductivity	52C	120.1	umhos/cm2	N/A			LCS	1410	100	99-100		Dup	1010	N/A	N/A	N/A	0.0	3.0	
Fluoride	12B	340.2	mg/L	0.10	ND		LCS	12.6	100	75-125		MS	2.00	100	101	75-125	0.2	20.0	
Nitrate	72D	353.2	mg/L	0.10	ND		LCS	9.58	102	75-125		MS	2.48	101	106	87-114	3.5	7.3	
pH	02A	150.1	units	N/A			LCS	8.00	99.1	97-101		Dup	7.66	N/A	N/A	N/A	0.1	1.4	
Sulfate	62A	300.0	mg/L	1.00	ND		CCV	107	91.3	89-109		MS	200	90.3	92.8	75-123	1.8	2.8	
	62B	300.0	mg/L	1.00	ND		CCV	107	88.8	89-109		MS	200	97.8	98.3	75-123	0.4	2.8	

FGL ID = 19940622 ND => Not Detected at or above DLR. DLR => Detection Limit for Reporting purposes. N/A => Not Applicable NOTE => See note indicated below.

FGL ENVIRONMENTAL, INC.

Kurt Wilkinson, QA/QC Director

KW/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 12, 1994

INORGANIC QA/QC Report for samples: 403651-403655

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

Constituent	BATCH ID	EPA Method	Units	BLANK QA/QC			CALIBRATION QA/QC					METHOD QA/QC							
				DLR	Result	NOTE	Type	Conc.	% REC	AR	NOTE	Type	Conc.	% REC	% REC	AR	% DIF	MAV	NOTE
Turbidity	02A	180.1	NTU		N/A					N/A		Dup	0.0800	N/A	N/A	N/A	0.0	27.2	

FGL ID = 19940623 ND => Not Detected at or above DLR. DLR => Detection Limit for Reporting purposes. N/A => Not Applicable NOTE => See note indicated below.

FGL ENVIRONMENTAL, INC.

Kurt Wilkinson, QA/QC Director

KW/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 11, 1994

RADIOCHEMISTRY QA/QC Report for samples: 403651-403655

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

Constituent	BATCH ID	EPA Method	Units	BLANK QA/QC			CALIBRATION QA/QC					METHOD QA/QC							
				DLR	Result	NOTE	Type	Conc.	% REC	AR	NOTE	Type	Conc.	% REC	% REC	AR	% DIF	MAV	NOTE
Gross Alpha	02A	900.0	pCi/L	1.0	ND				N/A			MS	50.1	93.9	110	60-140	13.1	30.0	
Gross Beta	02A	900.0	pCi/L	1.0	ND				N/A			MS	42.5	112	109	80-130	2.9	30.0	

FGL ID = 19940624 ND => Not Detected at or above DLR. DLR => Detection Limit for Reporting purposes. N/A => Not Applicable NOTE => See note indicated below.

FGL ENVIRONMENTAL, INC.

Kurt Wilkinson, QA/QC Director

MMF/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 8, 1994

ORGANIC QA/QC Report for sample: 403651

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

Constituent	BATCH ID	EPA Method	Units	CALIBRATION QA/QC					METHOD QA/QC						
				Type	Conc.	% REC	AR	NOTE	Type	Conc.	% REC	% REC	AR	% DIF	MAV
TOC	02A	TOC	mg/L	LCS	71.4	121	75-125		MS	50.0	117	118	75-125	0.5	20.0
TOX	02A	TOX	ug/L	CCV	10.0	84.7	74-116		MS	100	87.6	99.3	75-125	12.5	20.0

FGL ID = 19940630 N/A => Not Applicable NOTE => See note indicated below.

FGL ENVIRONMENTAL, INC.

Kurt Wilkinson, QA/QC Director

HNH/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 8, 1994

ORGANIC QA/QC Report for sample: 403652

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

Constituent	BATCH ID	EPA Method	Units	CALIBRATION QA/QC					METHOD QA/QC						
				Type	Conc.	% REC	AR	NOTE	Type	Conc.	% REC	% REC	AR	% DIF	MAV
TOC	02A	TOC	mg/L	LCS	71.4	121	75-125		MS	50.0	117	118	75-125	0.5	20.0
TOX	02A	TOX	ug/L	CCV	10.0	84.7	74-116		MS	100	87.6	99.3	75-125	12.5	20.0

FGL ID = 19940630 N/A => Not Applicable NOTE => See note indicated below.

FGL ENVIRONMENTAL, INC.

Kurt Wilkinson, QA/QC Director

HNH/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 8, 1994

ORGANIC QA/QC Report for sample: 403653

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

Constituent	BATCH ID	EPA Method	Units	CALIBRATION QA/QC					METHOD QA/QC						
				Type	Conc.	% REC	AR	NOTE	Type	Conc.	% REC	% REC	AR	% DIF	MAV
TOC	02A	TOC	mg/L	LCS	71.4	121	75-125		MS	50.0	117	118	75-125	0.5	20.0
TOX	02A	TOX	ug/L	CCV	10.0	84.7	74-116		MS	100	87.6	99.3	75-125	12.5	20.0

FGL ID = 19940630 N/A => Not Applicable NOTE => See note indicated below.

FGL ENVIRONMENTAL, INC.

Kurt Wilkinson, QA/QC Director

HNH/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 8, 1994

ORGANIC QA/QC Report for sample: 403654

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

Constituent	BATCH ID	EPA Method	Units	CALIBRATION QA/QC					METHOD QA/QC						
				Type	Conc.	% REC	AR	NOTE	Type	Conc.	% REC	% REC	AR	% DIF	MAV
TOC	02A	TOC	mg/L	LCS	71.4	121	75-125		MS	50.0	117	118	75-125	0.5	20.0
TOX	02A	TOX	ug/L	CCV	10.0	84.7	74-116		MS	100	87.6	99.3	75-125	12.5	20.0

FGL ID = 19940630 N/A => Not Applicable NOTE => See note indicated below.

HNH/DHN:c1

FGL ENVIRONMENTAL, INC.

Kurt Wilkinson, QA/QC Director



# ENVIRONMENTAL

## Analytical Chemists

July 8, 1994

ORGANIC QA/QC Report for sample: 403655

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

Constituent	BATCH ID	EPA Method	Units	CALIBRATION QA/QC					METHOD QA/QC						
				Type	Conc.	% REC	AR	NOTE	Type	Conc.	% REC	% REC	AR	% DIF	MAV
TOC	02A	TOC	mg/L	LCS	71.4	121	75-125		MS	50.0	117	118	75-125	0.5	20.0
TOX	02A	TOX	ug/L	CCV	10.0	84.7	74-116		MS	100	87.6	99.3	75-125	12.5	20.0

FGL ID = 19940630 N/A => Not Applicable NOTE => See note indicated below.

FGL ENVIRONMENTAL, INC.

Kurt Wilkinson, QA/QC Director

HNH/DHN:c1





**ENVIRONMENTAL**

---

**ANALYTICAL CHEMISTS**

# Quality Assurance Manual



**Corporate Offices & Laboratory**  
P.O. Box 272/853 Corporation Street  
Santa Paula, CA 93061-0272  
TEL: (805) 659-0910  
FAX: (805) 525-4172

**Office & Laboratory**  
2500 Stagecoach Road  
Stockton, CA 95215  
TEL: (209) 942-0181  
FAX: (209) 942-0423

**Field Office**  
Visalia, California  
TEL: (209) 734-9473  
Mobile: (209) 738-6273

# QUALITY ASSURANCE MANUAL

**FGL ENVIRONMENTAL**  
**853 Corporation Street**  
**Santa Paula, CA 93060**

Reviewed by: \_\_\_\_\_  
**Dudley S. Jayasinghe, Ph.D.**      **Date**  
*Technical Director*

Concurred by: \_\_\_\_\_  
**Kurt Wilkinson, B.S.**      **Date**  
*Quality Assurance Director*

Approved by: \_\_\_\_\_  
**Darrell H. Nelson, B.S.**      **Date**  
*Laboratory Director*

## TABLE OF CONTENTS

<u>Section</u>	<u>Revision</u>	<u>Date</u>	<u>Pages</u>
1 Title Page	2.0	1-15-94	1
2 Table of Contents	2.0	1-15-94	2
3 QA Plan Description	2.0	1-15-94	1
4 Laboratory Organization and Responsibilities	2.0	1-15-94	16
5 Quality Assurance Objectives for Measurement Data in Terms of Precision, Accuracy, Completeness, and Detection Limits for Reporting	2.0	1-15-94	30
6 Sampling Procedures	2.0	1-15-94	16
7 Sample Custody	2.0	1-15-94	6
8 Calibration Procedures and Frequency	2.0	1-15-94	5
9 Analytical Procedures	2.0	1-15-94	12
10 Data Reduction, Validation, and Reporting	2.0	1-15-94	2
11 Internal Quality Control Checks	2.0	1-15-94	19
12 Performance and System Audits	2.0	1-15-94	21
13 Preventative Maintenance	2.0	1-15-94	1
14 Specific Routine Procedures Used to Assess Data Precision, Accuracy & Completeness	2.0	1-15-94	2
15 Corrective Actions	2.0	1-15-94	3
16 Quality Assurance Reports to Management	2.0	1-15-94	3
Appendix A - Equipment List	2.0	1-15-94	2

## **LIST OF TABLES**

- Table 5-1 - Quality Assurance Objectives for Drinking Water Methods
- Table 5-2 - Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods
- Table 5-3 - Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods
- Table 6-1 - Recommended Sample Containers, Preservation and Holding Times
- Table 8-1 - GC/MS Volatile Organic Key Ion Abundance Tuning Criteria using BFB
- Table 8-2 - GC/MS Semivolatile Organic Key Ion Abundance Tuning Criteria using DFTPP
- Table 9-1 - Specific Analytical Drinking Water Methods
- Table 9-2 - Specific Analytical Wastewater / Hazardous Waste Liquid Methods
- Table 9-3 - Specific Analytical Solid Waste / Hazardous Waste Methods
- Table 11-1 - Quality Controls for Drinking Water Methods
- Table 11-2 - Quality Controls for Wastewater / Hazardous Waste Liquid Methods
- Table 11-3 - Quality Controls for Solid Waste / Hazardous Waste Methods

## **LIST OF FIGURES**

- Figure 4-1 - Organization Chart - Santa Paula Laboratory
- Figure 4-2 - Organization Chart - Stockton Laboratory
- Figure 7-1 - Chain of Custody
- Figure 11-1 - FGL Control Chart for LCS
- Figure 11-2 - FGL Control Chart for MS/MSD and RPD
- Figure 12-1 - FGL QC Inspection Form
- Figure 12-2 - FGL Santa Paula - CA DHS ELAP Certification
- Figure 12-3 - FGL Stockton - CA DHS ELAP Certification
- Figure 12-4 - FGL Santa Paula - NV DHR Certification
- Figure 15-1 - Corrective Action Report Form
- Figure 16-1 - FGL QC Inspection Summary Report Form

## QA Plan Description

The primary objective of FGL Environmental's quality assurance (QA) program is to ensure that all data is scientifically valid, defensible and of known precision and accuracy. Relative to the use for which the data are obtained, the data must be of sufficient known quality to withstand scientific and legal challenge

This manual describes the overall approach used by FGL Environmental to ensure that the primary objective of the QA/QC program is met. It outlines quality control procedures to be used with field and analytical methods. It also outlines the individual analysis data quality objectives which will accomplish the primary objective. Detailed project-specific FGL standard operating procedures to supplement this manual are provided whenever requested.

FGL's QA manual is based on the 16 essential elements contained in the U.S. Environmental Protection Agency manual "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans", QAMS-005/80.

As of the date of revision, this manual reflects the current quality assurance program in effect and items in progress of being implemented.

References for this manual include field and laboratory methods published by the U.S. Environmental Protection Agency and other agencies mainly through the following sources:

- (1) "Standard Methods for the Analysis of Water and Wastewater", 17th Edition, 1990.
- (2) "Methods for Chemical Analysis in Waters and Waste" (MCAWW) EPA-600/4-79-020
- (3) "Methods for the Determination of Organic Compounds in Drinking Water", EPA Method Book, EPA-600/4-88-039, December 1988.
- (4) "Methods for the Determination of Organic Compounds in Drinking Water-Supplement I", EPA Method Book, EPA-600/4-90-020, July 1990.
- (5) "Methods for the Determination of Organic Compounds in Drinking Water-Supplement II", EPA Method Book, EPA-600/4-90-020, July 1990.
- (6) "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater", EPA Method Book, EPA 600/4-82-057, July 1982.
- (7) "Methods for Evaluating Solid Waste", EPA Method Book, SW- 846, rev. 3, and Proposed Revisions.
- (8) "Prescribed Procedures for Measurement of Radioactivity in Drinking Water", EPA Method Book, EPA-600/4-80-032, August 1980.
- (9) "Handbook for Sampling and Sample Preservation of Water and Wastewater", EPA Method Book, EPA-600/4-82-029, September 1982.
- (10) "Eastern Environmental Radiation Facility Radiochemistry Procedures Manual", EPA Method Book, EPA 520/5-84-006, August 1984.
- (11) "Environmental Measurements Laboratory Procedures", HASL-300, 27th Edition, February 1992.



## Laboratory Organization and Responsibilities

### Personnel of FGL Incorporated

Our commitment to providing a superior service requires the high caliber staff employed by FGL. These professionals have considerable experience to meet the technical demand of environmental analysis.

#### Santa Paula

Darrell H. Nelson, B.S.	President & Lab Director
Denis Barry, B.Comm.	Marketing Director
Cheryl Long	Administrative Services Director
Dudley S. Jayasinghe, Ph.D.	Technical Director
Kurt Wilkinson, B.S.	Quality Assurance Director
Roger Perry, B.A.	Health & Safety Officer
Eric Cotting, M.S.	Radiation Safety Officer
Kurt Wilkinson, B.S.	Inorganic Lab Manager
Randy Johnson	Trace Metals Supervisor
Mike Schraml, B.S.	Environmental Chemist
Darrell Shon, B.S.	Environmental Chemist
Shelli Perry, B.S.	Environmental Chemist
Christine Sullivan, B.S.	Wet Chemistry Supervisor
Christy Masyr, B.S.	Environmental Chemist
Katy Prusso, B.S.	Environmental Chemist
Neal Hutchison, B.S.	Organic Lab Manager
Mark Bolyanatz, B.S.	Environmental Chemist
Rick Dotts, B.S.	Environmental Chemist
Sarah Edmundson	Environmental Chemist
Dudley S. Jayasinghe, Ph.D.	Environmental Chemist
Pam Lascoe, B.S.	Environmental Chemist
Juan M. Magana, B.S.	Environmental Chemist
Roger Perry, B.S.	Environmental Chemist
Michel Franco, B.A.	Radioactivity Lab Manager
Laura Reed	Lab Technician
Ricardo Sandoval, B.S.	Agricultural Lab Manager
Joan McKinney	Lab Technician
Raquel Harvey	Bacteriologist
Janelle Nelson	Bacteriologist
George Trouw	Field Services Director
Scott Bucy, B.S.	Field Services/Agronomist
Carl Tashima	Field Services
Jamie Johnson	Field Services
Pete Munoz	Field Services
Vickie Hengehold	Field Services
Eric Cotting, M.S.	Computer Programmer
Gary Hornbeck	Computer Programmer
Eva Anda, Ph.D.	Computer Programmer

## Laboratory Organization and Responsibilities

### Personnel continued

#### Santa Paula continued

Beverly Baca  
Cindy Aguirre

Accounting  
Accounting

Kristie Marlow  
Tiffany Douglas  
Martha Hamblin  
Erin Hart  
Tonya Lawson  
Cathy Metelak  
Shawn Parham  
Vickie Taylor

Customer Services Manager  
Customer Services  
Customer Services  
Customer Services  
Customer Services  
Customer Services  
Customer Services  
Customer Services

Stacey Berrington  
Gina Kolakowski, B.A.

Sample Receiving  
Sample Receiving

#### Stockton

John Quinn, Ph.D.  
Thomas M. Bartanen, M.S.

Vice President & Lab Director  
Quality Assurance Officer

John Gregory B.S.  
Alisha Tran B.S.  
Hao Van Le, B.S.

Environmental Chemist  
Environmental Chemist  
Environmental Chemist

Thomas M. Bartanen, M.S.  
Cynthia Phipps B.S.  
Madelyn Taasin  
Brian Sims

Environmental Chemist  
Environmental Chemist  
Technician  
Technician

Mark D. Brock  
Patrick Wheeler

Field Services  
Field Services

Joanna Culham  
Amelia de la Cruz  
Narine Sylvia

Office Manager  
Customer Services  
Customer Services

#### San Joaquin

Neil Jessup, B.S.

Agronomist/Field Service



## **Laboratory Organization and Responsibilities**

### **Key Personnel Qualification Summary - Santa Paula**

**Darrell H. Nelson**

#### **Current Responsibilities:**

**President and Lab Director**

- To oversee all operational aspects of the Santa Paula and Stockton laboratories
- To guide and direct managers towards the corporation's goals
- To report to the Board of Directors and the stockholders

#### **Work Experience:**

**Assistant Manager, FGL**

- Chemical analysis of drinking and waste waters, soils and plant materials
- Supervision of a number of lab operations including work scheduling and field
- Customer Interface

#### **Formal Education:**

- B.S. (1970) in Soil and Water Science, University of California, Davis.

#### **Continuing Education:**

- University of Southern California (USC) School of Business Administration, "Customer Service Management," April 1990.
- Hazardous Waste Operations and Emergency Response Training, OSHA 29 CFR 1910.120, 40 hr plus annual refresher.
- American Chemical Society (ACS), "Quality Assurance for Analytical Chemistry," Nov. 1991.
- University of California Davis (UCD), "Marketing Professional Services," Feb. 1988.
- University of California Davis (UCD), "Guerrilla Marketing," Feb. 1988.
- University of California Davis (UCD), "Enhancing Sales Skills," Feb. 1988.
- American Water Works Association, "Approved Water Sampling Procedures," March 1991.
- California Agricultural Leadership Program, 1976 - 1978.
- NPDES Requirements for Industrial and Construction Site Storm Water Discharges, ASCE, Feb. 1992.
- Senate bill #198, compliance training (State Fund Insurance)
- Nevada Nuclear Associates, "Fundamentals of Radiochemistry", February 1994.

#### **Memberships:**

**Professional:**

- American Chemical Society
- American Water Works Association
- Association of California Testing Laboratories

## **Laboratory Organization and Responsibilities**

### **Key Personnel Qualification Summary - Santa Paula**

**Denis Barry**

#### **Current Responsibilities:**

##### **Marketing Director**

- Responsible for marketing of FGL's services to city, county and state agencies in addition to private companies
- Compilation and implementation of FGL's marketing plans
- Responsible for FGL's informational and promotional materials

#### **Work Experience:**

- 3 years experience in marketing analytical services
- Marketing consultancy experience focused on small to medium sized companies
- International programs targeted mainly at the European Economic Community for small U.S. companies

#### **Formal Education:**

- B.Comm (Batchelor of Commerce), University College, Dublin, Ireland

#### **Continuing Education:**

- Computer Appreciation - Moorpark College, 1989

#### **Memberships:**

- Vice President - Irish American Club of Ventura County

## **Laboratory Organization and Responsibilities**

### **Key Personnel Qualification Summary - Santa Paula**

**Dudley S. Jayasinghe**

#### **Current Responsibilities:**

**Technical Director - Santa Paula**

- Develop new methods and monitor and improve existing methods
- Provide guidance and technical expertise to analysts, review of data and client reports
- Consult with clients on specific needs

#### **Work Experience:**

- 6 years on gas chromatograph/mass spectrometer
- 1 year GC/MS
- 3 years as research officer
- 2 years teaching at undergraduate level

#### **Formal Education:**

- B.S. (1980) in Organic Chemistry with minor in Physics, University of Peradeniya, Sri Lanka.
- Ph.D. (1989) in Analytical Chemistry with minor in Physical and Organic Chemistry, Oregon State University.

#### **Continuing Education:**

- Post-Doctoral Research in soil chemistry August 1989 - Sept. 1990, Oregon State University.

#### **Memberships:**

**Professional:**

- American Chemical Society
- Phi Lamda Upsilon Academic Honorarium

## **Laboratory Organization and Responsibilities**

### **Key Personnel Qualification Summary - Santa Paula**

#### **Kurt Wilkinson**

##### **Current Responsibilities:**

###### **Quality Assurance Director - Santa Paula**

- Primarily responsible for FGL's Quality Assurance Program

###### **Inorganic Lab Manager - Santa Paula**

- Work scheduling and planning for Inorganic Lab
- Staff training and general management
- Client consultation on analysis needs
- Data interpretation

##### **Work Experience:**

- 8 years experience in environmental testing of drinking water, wastewater, hazardous waste and air analysis
- Additional experience in agricultural testing of soils, plant tissue and food products

##### **Formal Education:**

- B.S. (1987) in Biochemistry, California Polytechnic State University, San Luis Obispo

##### **Continuing Education:**

- American Chemical Society (ACS), "Environmental Analytical Chemistry, Water and Waste", Nov. 1991.
- American Chemical Society (ACS), "Gas Chromatography/Mass Spectrometry", April 1992.
- Halliburton NUS, "Solving the Mysteries, Collecting Environmental Samples", April 1992.

##### **Memberships:**

###### **Professional:**

- Association of California Testing Laboratories quality assurance/quality control committee member.
- American Chemical Society (ACS)

## **Laboratory Organization and Responsibilities**

### **Key Personnel Qualification Summary - Santa Paula**

**Roger Perry**

#### **Current Responsibilities:**

**Health and Safety Officer**

- Responsible for design and implementation of FGL's Health and Safety programs
- Organic Department Chemist

#### **Experience:**

- 11 years experience as an environmental analytical chemist
- Health and Safety regulations and compliance
- Handling accumulation and disposal of Hazardous Wastes and Radioactive Materials

#### **Formal Education:**

- B.A. (1982) in Chemistry, Sonoma State University, Sonoma, California

#### **Continuing Education:**

- Hazardous Waste Operations and Emergency Response Training, OSHA 29 CFR 1910.120, 40 hr plus annual refresher.

## **Laboratory Organization and Responsibilities**

### **Key Personnel Qualification Summary - Santa Paula**

#### **Eric Cotting**

##### **Current Responsibilities:**

- Development and maintenance of FGL's Laboratory Information Management System (LIMS)
- Training of personnel in the effective use of LIMS

##### **Work Experience:**

- Developed customized LIMS system for FGL
- As research assistant with the University of Wisconsin, was involved in the modification of an existing theoretical computational program designed to model quantum mechanical properties of the Helium Atom

##### **Formal Education:**

- B.S. (1981) Chemistry, University of Alaska, Fairbanks, Alaska
- B.S. (1981) Math, University of Alaska, Fairbanks, Alaska
- B.S. (1981) Physics, University of Alaska, Fairbanks, Alaska
- M.S. (1987) Physical Chemistry, University of Wisconsin, Madison, Wisconsin

##### **Continuing Education:**

- Computer Networking Seminar: Santa Barbara, CA. January 1991
- Nevada Nuclear Associates, "Fundamentals of Radiochemistry", February 1994.

## Laboratory Organization and Responsibilities

### Key Personnel Qualification Summary - Santa Paula

H. Neal Hutchison

#### Current Responsibilities:

Organic Lab Manager

- Organization of work flow in Organic Laboratory
- Personnel training, methods development, instrument troubleshooting
- Response to specific customer enquiries

#### Work Experience:

- 8 years experience in environmental organic analysis
- 5 years of supervisory and management roles in organic laboratory operations

#### Formal Education:

- B.S. (1984) in Chemical Engineering, University of Nevada, Reno.

#### Continuing Education:

- Extrel training course, "Operation of Extrel ELQ 400 GC/MS", 1986.
- HP short course, "Practical Capillary Chromatography", 1988.
- UCSB Extension, "Introduction to Hazardous Waste Management", 1990.
- Hazardous Waste Operations and Emergency Response Training, OSHA 29 CFR 1910.120, 40 hr plus annual refresher.

#### Memberships:

Professional:

- Bay Area Mass Spectrometrists (BAMS)
- American Society of Mass Spectrometrists (ASMS)

## **Laboratory Organization and Responsibilities**

### **Key Personnel Qualification Summary - Santa Paula**

**Michel M. Franco**

#### **Current Responsibilities:**

##### **Radiochemistry Lab Manager**

- Work scheduling, staff supervision for Radiochemistry Laboratory
- Personnel training, methods development, instrument troubleshooting
- Client interface and project management

#### **Work Experience:**

- 6 years experience in radiochemical analysis, inorganic analysis and organic analysis for TOX and TOC.
- Developed instrument analysis experiment for CSUN (1988)
- Sample trouble shooting, processing and department liaison at Reference Laboratory (1986)

#### **Formal Education:**

- B.A. (1990) Chemistry, California State University, Northridge

#### **Continuing Education:**

- Nevada Nuclear Associates, "Fundamentals of Radiochemistry", February 1994.
- Canberra Industries Inc., "Environmental Radioactivity Quantification Workshop", March 1994.



## **Laboratory Organization and Responsibilities**

### **Key Personnel Qualification Summary - Santa Paula**

**Ricardo Sandoval**

#### **Current Responsibilities:**

- Agriculture Lab Manager - Santa Paula**
- Management of Agricultural Department**
- Supervision and training of staff**

#### **Work Experience:**

- 10 years experience in agricultural testing of soils and plant tissue**
- Ranch and Nursery experience dealing with irrigation, pollution, and transplantation**

#### **Formal Education:**

- B.S. (1985) in Crop Science and Technical Degree in Fruit Science, California Polytechnic State University, San Luis Obispo.**

## **Laboratory Organization and Responsibilities**

### **Key Personnel Qualification Summary - Stockton**

**John Quinn**

#### **Current Responsibilities:**

**Vice President and Lab Director - Stockton**

- Management of the Stockton Laboratory
- Liason with Santa Paula (Corporate) on Stockton lab's performance, budgets and financial results

#### **Work Experience:**

- 11 years experience in environmental analysis for drinking water, wastewater, hazardous waste and air samples
- Consultation with clients on analytical needs

#### **Formal Education:**

- B.A. (1965) in Chemistry, St. Peter's College
- C.Phil. (1972) in Organic Chemistry, U.C.L.A.
- Ph.D. (1973) in Organic Chemistry, U.C.L.A.

#### **Continuing Education:**

- CDFA, "Pesticide Residue Workshop." Feb. 1989, 1990, 1991, 1992.
- The Training Source, "Total Quality Management," Nov. 1991. - Coakley Analytical Associates, "Quality Assurance Programs for Environmental Data," Aug. 1988.
- University of California Davis (UCD), "Marketing Professional Services," Feb. 1988.
- University of California Davis (UCD), "Guerrilla Marketing," Feb. 1988.
- University of California Davis (UCD), "Enhancing Sales Skills," Feb. 1988.
- Finnigan Institute "Principles of GC/MS," 1983.
- Halliburton NUS, "Solving the Mysteries, Collecting Environmental samples", April 1992.

#### **Memberships:**

##### **Professional:**

- Sigma Xi, Chemical Honors Fraternity
- American Chemical Society
- American Water Works Association
- Association of California Testing Laboratories

## **Laboratory Organization and Responsibilities**

### **Key Personnel Qualification Summary - Stockton**

**Thomas Bartanen**

#### **Current Responsibilities:**

**Quality Assurance Officer - Stockton**

- Oversees Stockton laboratory's Quality Assurance Program
- Responsible for organic analysis on drinking water, wastewater, and hazardous waste samples

#### **Work Experience:**

- Experience includes work in soil microbiology, toxicity and reservoir limnology
- Direct customer consultation on needs, concerns and complaints

#### **Formal Education:**

- B.S. (1980) in Environmental Science, Bradley University, Peoria, IL
- M.S. (1987) in Aquatic Ecology, University of Nevada, Las Vegas

#### **Continuing Education:**

- American Association of Technologists GC/MS Workshop-data interpretation
- CDFA - Pesticide Residue Workshop

#### **Memberships:**

**Civic:**

- SCA Inc. (Historical Society)
- Finnish American Home Association (FAHA)

## **Laboratory Organization and Responsibilities**

### **Key Personnel Qualification Summary - San Joaquin**

**Neil Jessup**

#### **Current Responsibilities:**

- Agronomist/Field service - Visalia**
- Technical Representative - San Joaquin Valley**
- Coordinating sampling and sample pick up in the South San Joaquin Valley**
- Consultation with clients on sampling and analysis requirements**
- Proposal preparation for contracts on environmental and agricultural testing**

#### **Work Experience:**

- Ten years experience in areas of field service and sampling**
- Considerable background in city, county, state and federal regulations for environmental testing requirements**

#### **Formal Education:**

- B.S. (1977) in Agronomy, California Polytechnic State University, San Luis Obispo**

#### **Continuing Education:**

- OSHA 40 hour trained for hazardous waste and emergency response, confined space entry and SCBA**
- American Water Works Association, "Approved Water Sampling Procedures", March 1991.**
- Halliburton NUS, "Solving the Mysteries, Collecting Environmental Samples", April 1992.**

#### **Memberships:**

##### **Professional:**

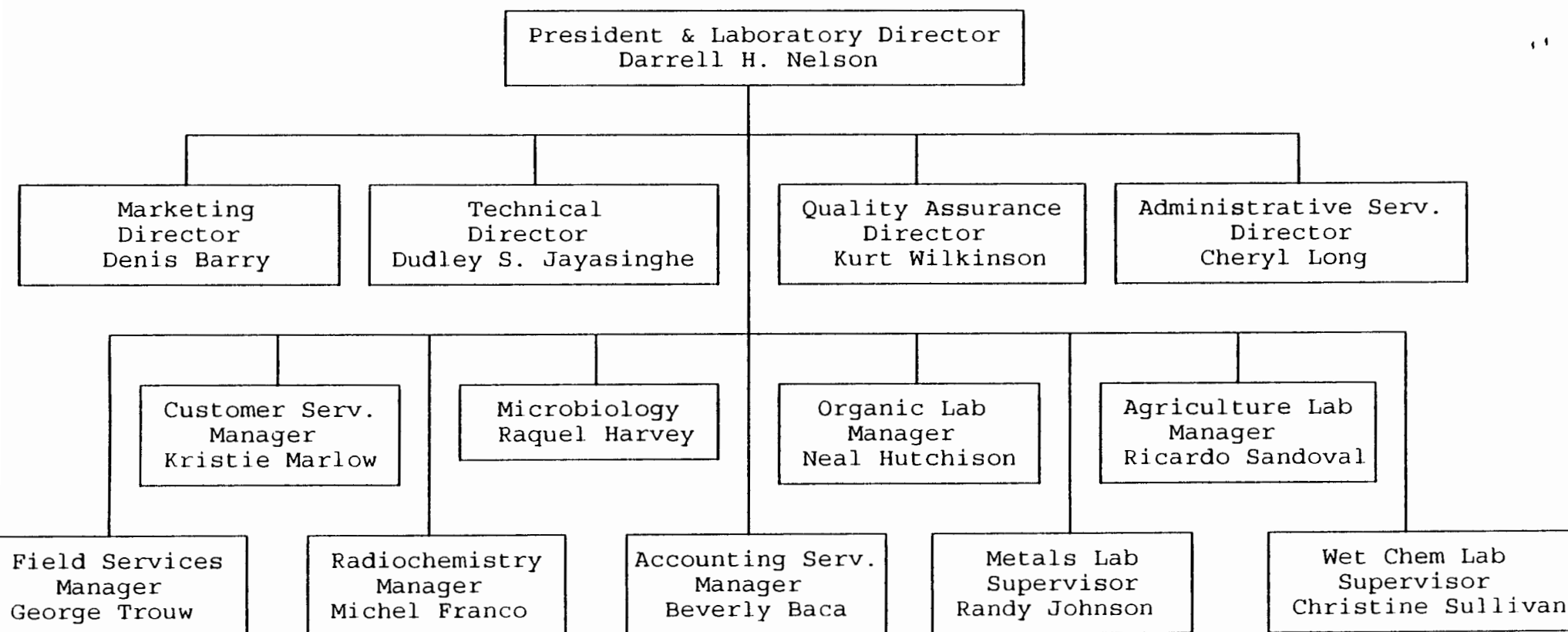
- California Agriculture Production Consultants Association (CAPCA)**

##### **Civic:**

- Tulare County Hazardous Waste Advisory Committee**

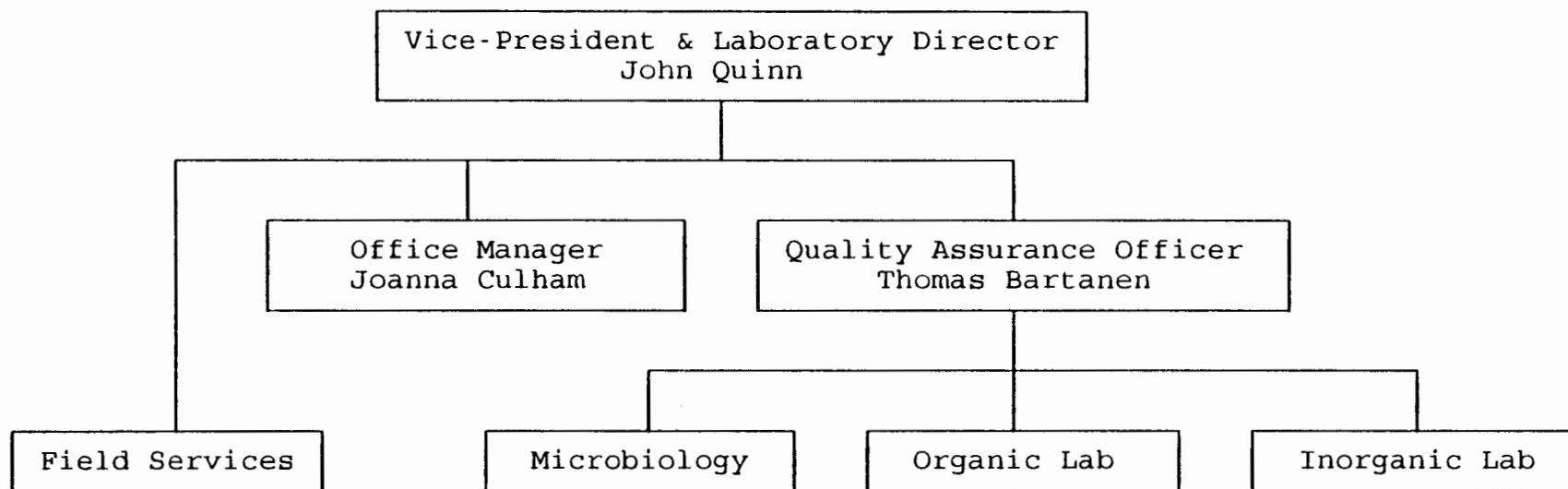
## Laboratory Organization and Responsibilities

Figure 4-1 Organization Chart - Santa Paula Laboratory



Laboratory Organization and Responsibilities

Figure 4-2 Organization Chart - Stockton Laboratory



## Quality Assurance Objectives

The quality assurance objectives for accuracy, precision, and Detection Limits for Reporting (DLR) are listed in Tables 5-1 (Drinking Water Methods), 5-2 (Wastewater / Hazardous Waste Liquid Methods) and 5-3 (Solid Waste / Hazardous Waste Solids Methods).

**Accuracy** - is based on the recovery measurement of a target analyte after known addition to a given sample or representative sample matrix (see section 14.2). Accuracy values are expressed as the percent recovery of the known value, and serve as a reflection of the total measurement error (random and systematic). The acceptance ranges for recovery (%REC-AR) are used for data validation.

**Precision** - is based on the difference measurement of duplicate data points (see section 14.1). Precision values are expressed as relative percent difference (RPD) and serve as a reflection of the variability in measurement replication. Surrogates are not run in duplicate, so RPDs are not applicable. The Maximum Acceptance Value for the RPD's (RPD-MAV) are used for data validation.

**Detection Limit for Reporting (DLR)** - is the routine detection limit FGL uses for reporting purposes. Detection limit studies are performed continually (see section 11.1.2.2) to ensure that the objectives listed in this section are met or exceeded. Surrogates are required for quality assurance purposes only. Therefore, DLR information is not necessary.

**Completeness** - FGL is currently introducing controls to document incomplete reports. These are reports that are known to lack information at the time of delivery or reports where we are notified by the client that information is not complete. Future QA manuals will have the results for data completeness documented.

TABLE 5-1 Quality Assurance Objectives for Drinking Water Methods

<u>CONSTITUENT</u>	<u>ACCURACY % REC-AR</u>	<u>PRECISION RPD-MAV</u>	<u>DLR ug/L</u>
EPA Method 501.2			
Bromodichloromethane	70-130	20	0.5
Bromoform	70-130	20	0.5
Chloroform	70-130	20	0.5
Dibromochloromethane	70-130	20	0.5
EPA Method 502.2			
Surrogates			
BFB	70-130	N/A	N/A
Fluorobenzene	70-130	N/A	N/A
Chlorofluorobenzene	70-130	N/A	N/A
Analytes			
Benzene	37-151	30	0.5
Bromobenzene	50-150	30	0.5
Bromochloromethane	50-150	30	0.5
Bromodichloromethane	35-155	30	0.5
Bromoform	45-169	30	0.5
Bromomethane	D-242	30	0.5
n-Butylbenzene	50-150	30	0.5
sec-Butylbenzene	50-150	30	0.5
tert-Butylbenzene	50-150	30	0.5

## Quality Assurance Objectives

TABLE 5-1 Quality Assurance Objectives for Drinking Water Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>ug/L</u>
Method EPA 502.2 continued			
Carbon tetrachloride	70-140	30	0.5
Chlorobenzene	37-160	30	0.5
Chloroethane	14-320	30	0.5
Chloroform	51-128	30	0.5
Chloromethane	D-273	30	0.5
2-Chlorotoluene	50-150	30	0.5
4-Chlorotoluene	50-150	30	0.5
DBCP	50-150	30	0.5
Dibromochloromethane	53-149	30	0.5
1,2-Dibromoethane	50-150	30	0.5
Dibromomethane	50-150	30	0.5
1,2-Dichlorobenzene	50-150	30	0.5
1,3-Dichlorobenzene	50-150	30	0.5
1,4-Dichlorobenzene	50-150	30	0.5
Dichlorodifluoromethane	50-150	30	0.5
1,1-Dichloroethane	59-155	30	0.5
1,2-Dichloroethane	49-155	30	0.5
1,1-Dichloroethylene	D-234	30	0.5
cis-1,2-Dichloroethylene	50-150	30	0.5
trans-1,2-Dichloroethylene	54-156	30	0.5
1,2-Dichloropropane	D-210	30	0.5
1,3-Dichloropropane	50-150	30	0.5
2,2-Dichloropropane	50-150	30	0.5
1,1-Dichloropropene	50-150	30	0.5
cis-1,3-Dichloropropene	D-227	30	0.5
trans-1,3-Dichloropropene	17-183	30	0.5
Ethylbenzene	37-162	30	0.5
Hexachlorobutadiene	50-150	30	0.5
Isopropylbenzene	50-150	30	0.5
p-Isopropyltoluene	50-150	30	0.5
Methylene Chloride	D-221	30	0.5
Naphthalene	50-150	30	0.5
n-Propylbenzene	50-150	30	0.5
Styrene	50-150	30	0.5
1,1,1,2-Tetrachloroethane	50-150	30	0.5
1,1,1,2,2-Tetrachloroethane	46-157	30	0.5
Tetrachloroethylene	64-148	30	0.5
Toluene	47-163	30	0.5
1,2,3-Trichlorobenzene	50-150	30	0.5
1,2,4-Trichlorobenzene	50-150	30	0.5
1,1,1-Trichloroethane	52-150	30	0.5
1,1,2-Trichloroethane	71-157	30	0.5
Trichloroethylene	71-157	30	0.5
Trichlorofluoromethane	17-181	30	0.5
1,2,3-Trichloropropane	50-150	30	0.5
1,1,2-Trichlorotrifluoroeth	50-150	30	0.5



## Quality Assurance Objectives

TABLE 5-1 Quality Assurance Objectives for Drinking Water Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>ug/L</u>
Method EPA 502.2 continued			
1,2,4-Trimethylbenzene	52-150	30	0.5
1,3,5-Trimethylbenzene	50-150	30	0.5
Vinyl Chloride	D-251	30	0.5
Xylenes m,p	50-150	30	0.5
Xylenes o	50-150	30	0.5
Method EPA 504			
DBCP	70-130	30	0.02
EDB	70-130	30	0.01
Method EPA 505			
Alachlor	50-150	30	0.2
Aldrin	42-122	30	0.01
Chlordane	45-119	30	0.1
Dieldrin	36-146	30	0.01
Endrin	30-147	30	0.01
Heptachlor	34-111	30	0.01
Heptachlor Epoxide	37-142	30	0.01
Hexachlorobenzene	50-150	30	0.01
Lindane	32-127	30	0.05
Methoxychlor	50-150	30	0.1
Toxaphene	41-126	30	0.5
PCB 1016	50-114	30	0.3
PCB 1221	15-178	30	0.3
PCB 1232	10-215	30	0.3
PCB 1242	39-150	30	0.3
PCB 1248	38-158	30	0.3
PCB 1254	29-131	30	0.3
PCB 1260	8-127	30	0.3
Method EPA 507			
Surrogates			
1,3-Dimethyl-2-nitrobenzene	53-105	N/A	N/A
9-Nitroanthracene	50-134	N/A	N/A
Analytes			
Alachlor	70-130	30	1
Atrazine	70-130	30	1
Bromocil	70-130	30	5
Butachlor	70-130	30	1
Diazinon	70-130	30	2
Dimethoate	70-130	30	2
Metolachlor	70-130	30	1
Metribuzin	70-130	30	0.1
Molinate	70-130	30	2
Prometryne	70-130	30	2
Propachlor	70-130	30	1

## Quality Assurance Objectives

TABLE 5-1 Quality Assurance Objectives for Drinking Water Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>ug/L</u>
Method EPA 507 continued			
Simazine	70-130	30	1
Thiobencarb	70-130	30	1
Method EPA 508			
Surrogate			
Hexachlorobenzene	70-130	N/A	N/A
Analytes			
Chlorothalonil	70-130	30	0.2
PCB 1016	50-114	30	0.08
PCB 1221	15-178	30	0.2
PCB 1232	10-215	30	0.2
PCB 1242	39-150	30	0.2
PCB 1248	38-158	30	0.1
PCB 1254	29-131	30	0.1
PCB 1260	8-127	30	0.2
Method EPA 508A			
PCB's as Decachlorobiphenyl	70-130	30	0.2
Method EPA 510			
Bromodichloromethane	70-130	30	0.5
Bromoform	70-130	30	0.5
Chloroform	70-130	30	0.5
Dibromochloromethane	70-130	30	0.5
Method EPA 515.1			
Surrogate			
2,4-DCAA	30-150	N/A	N/A
Analytes			
Bentazon	30-150	30	2
Chloramben	30-150	30	1
2,4-D	30-150	30	2
2,4-DB	30-150	30	2
Dalapon	30-150	30	2
Dicamba	30-150	30	5
Dichloroprop	30-150	30	2
Dinoseb	30-150	30	1
Pentachlorophenol	30-150	30	0.2
Picloram	30-150	30	1
2,4,5-T	30-150	30	1
2,4,5-TP (Silvex)	30-150	30	1

## Quality Assurance Objectives

TABLE 5-1 Quality Assurance Objectives for Drinking Water Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>ug/L</u>
Method EPA 524.2			
Surrogates			
1,2-Dichloroethane-d4	76-114	N/A	N/A
Toluene-d8	88-110	N/A	N/A
BFB	86-115	N/A	N/A
Analytes			
Acetone	50-150	30	0.5
Benzene	37-151	30	0.5
Bromobenzene	50-150	30	0.5
Bromochloromethane	50-150	30	0.5
Bromodichloromethane	35-155	30	0.5
Bromoform	45-169	30	0.5
Bromomethane	D-242	30	0.5
2-Butanone (MEK)	50-150	30	0.5
n-Butylbenzene	50-150	30	0.5
sec-Butylbenzene	50-150	30	0.5
tert-Butylbenzene	50-150	30	0.5
Carbon disulfide	50-150	30	0.5
Carbon tetrachloride	70-140	30	0.5
Chlorobenzene	37-160	30	0.5
Chloroethane	14-230	30	0.5
Chloroform	51-138	30	0.5
Chloromethane	D-273	30	0.5
2-Chlorotoluene	50-150	30	0.5
4-Chlorotoluene	50-150	30	0.5
Dibromochloromethane	53-149	30	0.5
1,2-Dibromoethane (EDB)	50-150	30	0.5
Dibromomethane	50-150	30	0.5
1,2-Dibromo-3-chloropropane	50-150	30	0.5
1,2-Dichlorobenzene	50-150	30	0.5
1,3-Dichlorobenzene	50-150	30	0.5
1,4-Dichlorobenzene	50-150	30	0.5
Dichlorodifluoromethane	50-150	30	0.5
1,1-Dichloroethane	59-155	30	0.5
1,2-Dichloroethane	49-155	30	0.5
1,1-Dichloroethylene	D-234	30	0.5
cis-1,2-Dichloroethylene	50-150	30	0.5
trans-1,2-Dichloroethylene	54-156	30	0.5
1,2-Dichloropropane	D-210	30	0.5
1,3-Dichloropropane	50-150	30	0.5
2,2-Dichloropropane	50-150	30	0.5
1,1-Dichloropropene	50-150	30	0.5
cis-1,3-Dichloropropene	D-227	30	0.5
trans-1,3-Dichloropropene	17-183	30	0.5
Ethylbenzene	37-162	30	0.5
Hexachlorobutadiene	50-150	30	0.5
2-Hexanone	50-150	30	0.5

## Quality Assurance Objectives

TABLE 5-1 Quality Assurance Objectives for Drinking Water Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>ug/L</u>
Method EPA 524.2 continued			
Isopropylbenzene	50-150	30	0.5
p-Isopropyltoluene	50-150	30	0.5
Methylene chloride	D-221	30	0.5
4-Methyl-2-pentanone (MIBK)	50-150	30	0.5
Naphthalene	50-150	30	0.5
n-Propylbenzene	50-150	30	0.5
Styrene	50-150	30	0.5
1,1,1,2-Tetrachloroethane	50-150	30	0.5
1,1,2,2-Tetrachloroethane	46-157	30	0.5
Tetrachloroethylene	64-148	30	0.5
Toluene	47-163	30	0.5
1,2,3-Trichlorobenzene	50-150	30	0.5
1,2,4-Trichlorobenzene	50-150	30	0.5
1,1,1-Trichloroethane	52-162	30	0.5
1,1,2-Trichloroethane	52-150	30	0.5
Trichloroethylene	71-157	30	0.5
Trichlorofluoromethane	17-181	30	0.5
1,2,3-Trichloropropane	50-150	30	0.5
1,1,2-Trichlorotrifluoroeth	50-150	30	0.5
1,2,4-Trimethylbenzene	50-150	30	0.5
Vinyl acetate	50-150	30	0.5
Vinyl chloride	D-251	30	0.5
Xylenes m,p	50-150	30	0.5
Xylenes o	50-150	30	0.5
Method EPA 525			
Surrogate			
Perylene-d12	50-150	N/A	N/A
Analytes			
Acenaphthylene	50-150	30	1
Anthracene	50-150	30	1
Benzo(a)anthracene	50-150	30	1
Benzo(b)fluoranthene	50-150	30	1
Benzo(k)fluoranthene	50-150	30	1
Benzo(g,h,i)perylene	50-150	30	1
Benzo(a)pyrene	50-150	30	0.1
Butylbenzylphthalate	50-150	30	1
Chrysene	50-150	30	1
Dibenzo(a,h)anthracene	50-150	30	1
Dimethylphthalate	50-150	30	1
Diethylphthalate	50-150	30	1
Di-n-butylphthalate	50-150	30	1
bis(2-Ethylhexyl)adipate	50-150	30	1
bis(2-Ethylhexyl)phthalate	29-137	30	3
Fluorene	50-150	30	1
Hexachlorobenzene	50-150	30	1

## Quality Assurance Objectives

TABLE 5-1 Quality Assurance Objectives for Drinking Water Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>ug/L</u>
Method EPA 525 continued			
Hexachlorocyclopentadiene	50-150	30	1
Indeno(1,2,3-c,d)pyrene	50-150	30	1
Pentachlorophenol	50-150	30	4
Phenanthrene	50-150	30	1
Pyrene	50-150	30	1
Method EPA 531.1			
Surrogate			
BDMC	70-130	N/A	N/A
Analytes			
Aldicarb	70-130	30	3
Aldicarb Sulfone	70-130	30	3
Aldicarb Sulfoxide	70-130	30	3
Carbofuran	70-130	30	5
Carbaryl	70-130	30	5
3-Hydroxycarbofuran	70-130	30	10
Methiocarb	70-130	30	10
Methomyl	70-130	30	5
1-Napthol	70-130	30	5
Oxymal	70-130	30	5
Propoxur	70-130	30	5
Method EPA 547			
Glyphosate	70-130	20	20
Method EPA 548			
Endothall	70-130	20	40
Method EPA 549			
Diquat	70-130	20	2
Paraquat	70-130	20	1
Method EPA 550.1			
Acenaphthene	70-130	20	3
Acenaphthylene	70-130	20	2
Anthracene	70-130	20	0.1
Benzo(a)anthracene	70-130	20	0.1
Benzo(a)pyrene	70-130	20	0.1
Benzo(b)fluoranthene	70-130	20	0.2
Benzo(g,h,i)perylene	70-130	20	0.1
Benzo(k)fluoranthene	70-130	20	0.1
Chrysene	70-130	20	0.1
Dibenzo(a,h)anthracene	70-130	20	0.3
Fluoranthene	70-130	20	2
Fluorene	70-130	20	2
Indeno(1,2,3-c,d)pyrene	70-130	20	0.1

## Quality Assurance Objectives

TABLE 5-1 Quality Assurance Objectives for Drinking Water Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>ug/L</u>
Method EPA 550.1 continued			
1-Methylnaphthalene	70-130	20	2
2-Methylnaphthalene	70-130	20	2
Naphthalene	70-130	20	2
Phenanthrene	70-130	20	2
Pyrene	70-130	20	0.1
Method EPA 552			
Bromochloroacetic acid	70-130	20	1
Dibromoacetic acid	70-130	20	1
Dichloroacetic acid	70-130	20	1
2,4-Dichlorophenol	70-130	20	1
Monobromoacetic acid	70-130	20	1
Monochloroacetic acid	70-130	20	1
Trichloroacetic acid	70-130	20	1
2,4,6-Trichlorophenol	70-130	20	1

<u>CONSTITUENT</u>	<u>Method</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>mg/L</u>
Inorganic Chemicals				
Acidity	305.1	N/A	20	1
Alkalinity (as CaCO <sub>3</sub> )	310.0	N/A	20	1
Bicarbonate	310.1	N/A	20	1
BOD	405.1	80-120	20	2
Bromide	300.0	80-120	20	0.5
Carbon Dioxide	SM4500C	N/A	20	1
Carbonate	310.1	N/A	20	1
COD	410.2	75-125	20	4
Chloride	300.0	80-120	20	1
Chlorine Residual	330.2	N/A	20	0.1
Chlorine Residual	330.3	N/A	20	0.1
Color	110.3	N/A	20	3 units
Electrical Conductivity	120.1	80-120	20	1 umhos
Cyanide, Total	335.2	75-125	20	0.01
Fluoride by electrode	340.2	80-120	20	0.1
Hydroxide	310.0	N/A	20	1
MBAS	425.1	70-130	20	0.05
Nitrogen				
Ammonia	350.1	80-120	20	1
Nitrate	300.0	80-120	20	0.1
Nitrite	300.0	80-120	20	0.1
Nitrate	353.2	80-120	20	0.1
Nitrite	353.2	80-120	20	0.1
Total Kjeldahl	351.2	80-120	20	1
Odor	140.1	N/A	20	1 TON

## Quality Assurance Objectives

TABLE 5-1 Quality Assurance Objectives for Drinking Water Methods

<u>CONSTITUENT</u>	<u>Method</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>mg/L</u>
Inorganic Chemical EPA Methods continued				
Oil and Grease	413.1	N/A	20	3
Oxygen, dissolved	360.1	N/A	20	0.5
pH	150.1	N/A	20	N/A
Phenols	420.1	75-125	20	0.1
Phosphorous				
Phosphate	300.0	80-120	20	0.1
Total	365.4	75-125	20	0.1
Solids/Residue				
Filterable (TDS)	160.1	NA	20	40
Non-filterable (TSS)	160.2	NA	20	10
Total	160.3	NA	20	40
Volatile	160.4	NA	20	40
Settleable	160.5	NA	20	0.1 ml/L
Sulfate	300.0	80-120	20	1
Sulfide				
Total	376.2	N/A	20	0.1
Dissolved	376.2	N/A	20	0.1
Sulfite	377.1	N/A	20	0.1
Tannin & Lignin	SM5500B	N/A	20	1
Titration - pH adjust.	N/A	N/A	20	1
Turbidity	180.1	N/A	20	0.2 NTU
<u>CONSTITUENT</u>	<u>Method</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>mg/L</u>
Trace Metals				
Aluminum	200.9	75-125	20	20
Aluminum	200.8	75-125	20	5
Antimony	200.9	75-125	20	5
Antimony	200.8	75-125	20	0.5
Arsenic	200.9	75-125	20	2
Arsenic	200.8	75-125	20	2
Barium	200.7	80-120	20	20
Barium	200.8	75-125	20	0.5
Beryllium	200.9	75-125	20	1
Beryllium	200.8	75-125	20	0.5
Boron	200.7	80-120	20	0.1 mg/L
Boron	200.8	75-125	20	0.01 mg/L
Cadmium	200.9	75-125	20	1
Cadmium	200.8	75-125	20	0.5
Calcium	200.7	80-120	20	1 mg/L
Chromium	200.9	75-125	20	5
Chromium	200.8	75-125	20	2
Chromium VI	7196	D-120	20	10
Cobalt	200.7	80-120	20	50
Cobalt	200.8	75-125	20	0.5

## Quality Assurance Objectives

TABLE 5-1 Quality Assurance Objectives for Drinking Water Methods

<u>CONSTITUENT</u>	<u>Method</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>ug/L</u>
Trace Metals continued				
Copper	200.7	80-120	20	50
Copper	200.8	75-125	20	2
Iron	200.7	80-120	20	50
Lead	200.9	75-125	20	5
Lead	200.8	75-125	20	0.5
Lithium	SM3500L	80-120	20	10
Magnesium	200.7	80-120	20	1 mg/L
Manganese	200.7	80-120	20	30
Manganese	200.8	75-125	20	1
Mercury	245.1	75-125	20	0.2
Mercury	245.2	75-125	20	0.2
Molybdenum	200.7	80-120	20	50
Molybdenum	200.8	75-125	20	0.5
Nickel	200.7	80-120	20	50
Nickel	200.8	75-125	20	1
Potassium	200.7	80-120	20	1 mg/L
Selenium	200.9	75-125	20	2
Selenium	200.8	75-125	20	2
Silica	200.7	80-120	20	1 mg/L
Silver	200.9	75-125	20	0.5
Silver	200.8	75-125	20	0.5
Sodium	200.7	80-120	20	1 mg/L
Strontium	200.7	80-120	20	50
Thallium	200.9	75-125	20	2
Thallium	200.8	75-125	20	0.5
Tin	200.9	75-125	20	50
Uranium	200.7	80-120	20	100
Vanadium	200.7	80-120	20	20
Zinc	200.7	80-120	20	50
Zinc	200.8	75-125	20	5

<u>CONSTITUENT</u>	<u>Method</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>pCi/L</u>
Radiochemistry EPA Methods				
Gross Alpha	900.0	80-120	20	0.1
Gross Beta	900.0	80-120	20	0.1
Radon	913.0	80-120	20	10
Strontium 90	905.0	80-120	20	1
Total Radium	900.1	80-120	20	0.1
Tritium	906.0	80-120	20	200
Uranium	908.0	80-120	20	0.1



## Quality Assurance Objectives

TABLE 5-2 Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>ug/L</u>
Method EPA 601/8010			
Surrogates			
BFB	50-150	N/A	N/A
Fluorobenzene	50-150	N/A	N/A
Chlorofluorobenzene	50-150	N/A	N/A
Analytes			
Bromodichloromethane	42-172	20	0.5
Bromoform	13-159	20	0.5
Bromomethane	D-144	20	0.5
Carbon tetrachloride	43-143	20	0.5
Chlorobenzene	38-150	20	0.5
Chloroethane	46-137	20	0.5
Chloroform	49-133	20	0.5
Chloromethane	D-193	20	0.5
Dibromochloromethane	24-191	20	0.5
1,2-Dichlorobenzene	D-208	20	0.5
1,3-Dichlorobenzene	7-187	20	0.5
1,4-Dichlorobenzene	42-143	20	0.5
Dichlorodifluoromethane	50-150	20	0.5
1,1-Dichloroethane	47-132	20	0.5
1,2-Dichloroethane	51-147	20	0.5
1,1-Dichloroethylene	28-167	20	0.5
trans-1,2-Dichloroethylene	38-155	20	0.5
1,2-Dichloropropane	44-156	20	0.5
cis-1,3-Dichloropropene	22-178	20	0.5
trans-1,3-Dichloropropene	22-178	20	0.5
Methylene chloride	25-162	20	0.5
1,1,2,2-Tetrachloroethane	50-150	20	0.5
Tetrachloroethylene	26-162	20	0.5
1,1,1-Trichloroethane	41-138	20	0.5
1,1,2-Trichloroethane	39-139	20	0.5
Trichloroethylene	81-119	20	0.5
Trichlorofluoromethane	21-156	20	0.5
Vinyl chloride	28-163	20	0.5
Method EPA 8015M TPH (purgeable)			
Gas	50-150	40.0	500
Method EPA 8015M TPH (extractable)			
Crude oil	50-150	40.0	500
Diesel fuel	50-150	40.0	500
Hydraulic oil	50-150	40.0	500
Jet fuel	50-150	40.0	500
Stoddard solvent	50-150	40.0	500
Waste oil	50-150	40.0	2000

## Quality Assurance Objectives

TABLE 5-2 Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>ug/L</u>
Method EPA 602/8020			
Surrogates			
BFB	50-150	N/A	N/A
Analytes			
Benzene	78-133	20	0.3
Chlorobenzene	73-132	20	0.3
1,2-Dichlorobenzene	64-143	20	0.3
1,3-Dichlorobenzene	61-150	20	0.3
1,4-Dichlorobenzene	61-151	20	0.3
Ethylbenzene	75-129	20	0.3
Toluene	61-164	20	0.3
Xylene, o	69-137	20	0.3
Xylene, p	71-135	20	0.3
Xylene, m	68-133	20	0.3
Method EPA 604/8040 (analyzed by method 625/8270)			
2-Chlorophenol	23-134	30	10
2,4-Dichlorophenol	39-135	30	10
2,4-Dimethylphenol	42-109	30	10
4,6-Dinitro-o-cresol	D-181	30	50
2,4-Dinitrophenol	D-191	30	50
2-Methylphenol	50-150	30	10
4-Methylphenol	50-150	30	10
2-Nitrophenol	29-182	30	10
4-Nitrophenol	29-182	30	50
p-Chloro-m-cresol	22-147	30	20
Pentachlorophenol	14-176	30	50
Phenol	5-112	30	10
2,4,5-Trichlorophenol	37-144	30	10
2,4,6-Trichlorophenol	37-144	30	10
Method EPA 608/8080			
Surrogates			
Hexachlorobenzene	26-116	N/A	N/A
Dibutylchloroendate	44-125	N/A	N/A
Analytes			
Aldrin	20-123	30	0.2
Alpha BHC	37-134	30	0.2
Beta BHC	17-147	30	0.2
Delta BHC	19-140	30	0.2
Chlordane	45-119	30	0.2
o,p - DDD	31-141	30	0.2
p,p - DDD	31-141	30	0.2
o,p - DDE	30-145	30	0.2
p,p - DDE	30-145	30	0.2
o,p - DDT	25-160	30	0.2
p,p - DDT	70-160	30	0.2

## Quality Assurance Objectives

TABLE 5-2 Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>ug/L</u>
Method EPA 608/8080 continued			
Dieldrin	47-126	30	0.2
Endosulfan I	45-153	30	0.2
Endosulfan II	D-202	30	0.2
Endosulfan sulfate	26-144	30	0.2
Endrin	30-147	30	0.2
Endrin aldehyde	50-150	30	0.2
Heptachlor	25-133	30	0.2
Heptachlor epoxide	37-142	30	0.2
Lindane	81-119	30	0.2
Methoxychlor	50-150	30	0.5
Toxaphene	41-126	30	5
PCB 1016	50-114	30	2
PCB 1221	15-178	30	2
PCB 1232	10-215	30	2
PCB 1242	39-150	30	2
PCB 1248	38-158	30	2
PCB 1254	29-131	30	2
PCB 1260	8-127	30	2
Method EPA 610/8310			
Acenaphthene	70-130	20	3
Acenaphthylene	70-130	20	2
Anthracene	70-130	20	0.1
Benzo(a)anthracene	70-130	20	0.1
Benzo(b)fluoranthene	70-130	20	0.2
Benzo(k)fluoranthene	70-130	20	0.1
Benzo(g,h,i)perylene	70-130	20	0.1
Benzo(a)pyrene	70-130	20	0.2
Chrysene	70-130	20	0.1
Dibenzo(a,h)anthracene	70-130	20	0.3
Fluoranthene	70-130	20	2
Fluorene	70-130	20	2
Indeno(1,2,3-c,d)pyrene	70-130	20	0.1
Naphthalene	70-130	20	2
Phenanthrene	70-130	20	2
Pyrene	70-130	20	0.1
Method EPA 614/8140			
Surrogates			
1,3-Dimethyl-2-nitrobenzene	50-150	N/A	N/A
9-Nitroanthracene	50-150	N/A	N/A
Analytes			
Azinphos methyl	50-150	30	2
Bolstar	50-150	30	2
Chlorpyrifos	50-150	30	2
Coumaphos	50-150	30	2

## Quality Assurance Objectives

TABLE 5-2 Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>ug/L</u>
Method EPA 614/8140 continued			
Demeton-o,s	50-150	30	2
Diazinon	50-150	30	2
Dichlorvos	50-150	30	2
Disulfoton	50-150	30	2
Ethion	50-150	30	2
Ethoprop	50-150	30	2
Fensulfoton	50-150	30	2
Fenthion	50-150	30	2
Malathion	50-150	30	2
Merphos	50-150	30	2
Mevinphos	50-150	30	2
Naled	50-150	30	2
Parathion, ethyl	50-150	30	2
Parathion, methyl	50-150	30	2
Phorate	50-150	30	2
Ronnel	50-150	30	2
Stirophos	50-150	30	2
Tokuthion	50-150	30	2
Trichlornate	50-150	30	2
Method EPA 615/8150			
Surrogate			
2,4-DCAA	30-150	N/A	N/A
Analytes			
Bentazon	30-150	30	20
Chloramben	30-150	30	10
2,4-D	30-150	30	100
Dalapon	30-150	30	10
2,4-DB	30-150	30	100
Dicamba	30-150	30	10
Dichlorprop	30-150	30	20
Dinoseb	30-150	30	10
Pentachlorophenol	30-150	30	10
Picloram	30-150	30	10
2,4,5-T	30-150	30	10
2,4,5-TP (Silvex)	30-150	30	10
Method EPA 624/8240			
Surrogates			
1,2-Dichloroethane-d4	76-114	30	N/A
Toluene-d8	88-110	30	N/A
BFB	86-115	30	N/A
Analytes			
Acetone	50-150	30	10
Acrolein	50-150	30	100
Acrylonitrile	50-150	30	100

## Quality Assurance Objectives

TABLE 5-2 Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>ug/L</u>
Method EPA 624/8240 continued			
Benzene	37-151	30	0.5
Bromodichloromethane	35-155	30	1
Bromoform	45-169	30	1
Bromomethane	D-242	30	1
Carbon disulfide	50-150	30	5
Carbon tetrachloride	70-140	30	0.5
Chlorobenzene	37-160	30	0.5
Chloroethane	14-230	30	1
2-Chloroethylvinyl ether	50-150	30	10
Chloroform	51-138	30	0.5
Chloromethane	D-273	30	1
Dibromochloromethane	53-149	30	1
1,2-Dichlorobenzene	50-150	30	1
1,3-Dichlorobenzene	50-150	30	1
1,4-Dichlorobenzene	50-150	30	1
Dichlorodifluoromethane	50-150	30	0.5
1,1-Dichloroethane	59-155	30	1
1,2-Dichloroethane	49-155	30	1
1,1-Dichloroethylene	D-234	30	1
trans-1,2-Dichloroethylene	54-156	30	1
1,2-Dichloropropane	D-210	30	1
cis-1,3-Dichloropropene	D-227	30	2
trans-1,3-Dichloropropene	17-183	30	1
Ethanol	50-150	30	5000.
Ethylbenzene	37-162	30	0.5
2-Hexanone	50-150	30	5
Methylene chloride	D-221	30	0.5
2-Butanone (MEK)	50-150	30	10
4-Methyl-2-pentanone (MIBK)	50-150	30	5
Styrene	50-150	30	1
1,1,2,2-Tetrachloroethane	46-157	30	1
Tetrachloroethylene	64-148	30	1
Toluene	47-163	30	0.5
1,1,1-Trichloroethane	52-162	30	0.5
1,1,2-Trichloroethane	52-150	30	0.5
Trichloroethylene	71-157	30	1
Trichlorofluoromethane	17-181	30	1.5
Vinyl acetate	50-150	30	100
Vinyl chloride	D-251	30	0.5
Xylenes	50-150	30	1

## Quality Assurance Objectives

TABLE 5-2 Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>ug/L</u>
Method EPA 625/8270			
Surrogates			
2-Fluorobiphenyl	43-106	30	N/A
Nitrobenzene-d5	39-98	30	N/A
p-Terphenyl-d14	62-114	30	N/A
2-Fluorophenol	21-100	30	N/A
Phenol-d6	10-94	30	N/A
2,4,6-Tribromophenol	11-100	30	N/A
Analytes			
Acenaphthene	36-130	30	10
Acenaphthylene	33-145	30	10
Aniline	50-150	30	50
Anthracene	27-133	30	10
Benzo(a)anthracene	33-143	30	10
Benzo(a)pyrene	17-163	30	10
Benzo(b)fluoranthene	24-159	30	10
Benzo(k)fluoranthene	11-162	30	10
Benzo(g,h,i)perylene	D-219	30	10
Benzylalcohol	50-150	30	20
bis(2-Chloroethoxy)methane	33-184	30	10
bis(2-Chloroethyl)ether	12-158	30	10
bis(2-Chloroisopropyl)ether	36-166	30	10
bis(2-Ethylhexyl)phthalate	29-137	30	10
4-Bromophenylphenylether	65-114	30	10
Butylbenzylphthalate	D-152	30	10
Chloroaniline	50-150	30	10
Chloronaphthalene	60-180	30	10
Chlorophenylphenylether	25-158	30	10
Chrysene	17-168	30	10
Dibenzo(a,h)anthracene	D-227	30	10
Dibenzofuran	50-150	30	10
1,2-Dichlorobenzene	32-129	30	10
1,3-Dichlorobenzene	D-172	30	10
1,4-Dichlorobenzene	33-114	30	10
3,3'-Dichlorbenzidine	8-213	30	20
Diethylphthalate	D-114	30	10
Dimethylphthalate	D-112	30	10
Di-n-butylphthalate	1-118	30	10
2,4-Dinitrotoluene	37-111	30	10
2,6-Dinitrotoluene	50-158	30	10
Di-n-octylphthalate	4-146	30	10
Fluoranthene	26-137	30	10
Fluorene	59-121	30	10
Hexachlorobenzene	50-150	30	10
Hexachlorobutadiene	24-116	30	10
Hexachlorocyclopentadiene	50-150	30	10
Hexachloroethane	40-113	30	10

## Quality Assurance Objectives

TABLE 5-2 Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>ug/L</u>
Method EPA 625/8270 continued			
Indeno(1,2,3-c,d)pyrene	50-150	30	10
Isophorone	21-196	30	10
2-Methylnaphthalene	50-150	30	10
Naphthalene	21-133	30	10
Nitrobenzene	35-180	30	10
N-Nitrosodimethylamine	50-150	30	10
N-Nitrosodi-N-propylamine	D-112	30	10
N-Nitrosodiphenylamine	50-150	30	10
2-Nitroaniline	50-150	30	50
3-Nitroaniline	50-150	30	50
4-Nitroaniline	50-150	30	50
Phenanthrene	54-120	30	10
Pyrene	73-119	30	10
1,2,4-Trichlorobenzene	35-122	30	10
2-Chlorophenol	27-143	30	10
2,4-Dichlorophenol	39-135	30	10
2,4-Dimethylphenol	42-109	30	10
4,6-Dinitro-o-cresol	D-181	30	50
2,4-Dinitrophenol	D-191	30	50
2-Methylphenol	50-150	30	10
4-Methylphenol	50-150	30	10
2-Nitrophenol	29-182	30	10
4-Nitrophenol	D-53	50	50
p-Chloro-m-cresol	22-147	30	20
Pentachlorophenol	D-112	30	50
Phenol	D-82	30	10
2,4,5-Trichlorophenol	50-150	30	10
2,4,6-Trichlorophenol	37-144	30	10
Method EPA 632			
Barban	30-150	30	0.5
Carbaryl	30-150	30	0.2
Carbofuran	30-150	30	30
Chlorpropham	30-150	30	0.3
Diuron	30-150	30	0.1
Fluometuron	30-150	30	100
Linoron	30-150	30	0.1
Methiocarb	30-150	30	0.2
Methomyl	30-150	30	100
Monuron	30-150	30	0.1
Neburon	30-150	30	0.1
Oxamyl	30-150	30	100
Propham	30-150	30	0.7
Propoxur	30-150	30	1
Siduron	30-150	30	1
Swep	30-150	30	2

## Quality Assurance Objectives

TABLE 5-2 Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>ug/L</u>
Method EPA 415.1/9060 TOC	80-120	20	0.5 mg/L
Method EPA 9020 TOX	80-120	20	0.5
Method EPA 418.1 TRPH-By IR	50-150	20	0.5 mg/L

<u>CONSTITUENT</u>	<u>Method</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>mg/L</u>
Inorganic Chemicals				
Acidity	305.1	N/A	20	1
Alkalinity (as CaCO <sub>3</sub> )	310.0	N/A	20	1
Bicarbonate	310.1	N/A	20	1
BOD	405.1	80-120	20	2
Bromide	360.0	80-120	20	0.5
Carbon Dioxide	SM4500C	N/A	20	1
Carbonate	310.1	N/A	20	1
COD	410.2	75-125	20	4
Chloride	300.0	80-120	20	1
Chlorine Residual	330.2	N/A	20	0.1
Chlorine Residual	330.3	N/A	20	0.1
Color	110.3	N/A	20	3 units
Electrical Conductivity	120.1	80-120	20	1 umhos
Cyanide, Total	335.2	75-125	20	0.01
Fluoride by electrode	340.2	80-120	20	0.1
Hydroxide	310.0	N/A	20	1
MBAS	425.1	70-130	20	0.05
Nitrogen				
Ammonia	350.1	80-120	20	1
Nitrate	300.0	80-120	20	0.1
Nitrite	300.0	80-120	20	0.1
Nitrate	353.2	80-120	20	0.1
Nitrite	353.2	80-120	20	0.1
Total Kjeldahl	351.2	80-120	20	1
Odor	140.1	N/A	20	1 TON
Oil and Grease	413.1	N/A	20	3
Oxygen, dissolved	360.1	N/A	20	0.5
pH	150.1	N/A	20	N/A
Phenols	420.1	75-125	20	0.1
Phosphorous				
phosphate	300.0	80-120	20	0.1
Total	365.4	75-125	20	0.1



## Quality Assurance Objectives

TABLE 5-2 Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods

<u>CONSTITUENT</u>	<u>Method</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>mg/L</u>
<b>Inorganic Chemicals continued</b>				
<b>Solids/Residue</b>				
Filterable (TDS)	160.1	NA	20	40
Non-filterable (TSS)	169.2	NA	20	10
Total	160.3	NA	20	40
Volatile	160.4	NA	20	40
Settleable	160.5	NA	20	0.1 ml/L
Sulfate	300.0	80-120	20	1
Sulfide				
Total	376.2	N/A	20	0.1
Dissolved	376.2	N/A	20	0.1
Sulfite	377.1	N/A	20	0.1
Tannin & Lignin	SM5500B	N/A	20	1
Titration - pH adjust.	N/A	N/A	20	1
Turbidity	180.1	N/A	20	0.2 NTU
<b>Trace Metals</b>				
Aluminum	200.9	75-125	20	0.02
Aluminum	200.8	75-125	20	0.1
Antimony	200.9	75-125	20	0.02
Antimony	200.8	75-125	20	0.005
Arsenic	200.9	75-125	20	0.005
Arsenic	200.8	75-125	20	0.02
Barium	200.7	80-120	20	0.02
Barium	200.8	75-125	20	0.005
Beryllium	200.7	80-120	20	0.01
Beryllium	200.8	75-125	20	0.005
Boron	200.7	80-120	20	0.1
Boron	200.8	75-125	20	0.1
Cadmium	200.9	75-125	20	0.005
Cadmium	200.8	75-125	20	0.005
Calcium	200.7	80-120	20	1
Chromium	200.9	75-125	20	0.01
Chromium	200.8	75-125	20	0.02
Chromium VI	7196	D-120	20	0.01
Cobalt	200.7	80-120	20	0.05
Cobalt	200.8	75-125	20	0.005
Copper	200.7	80-120	20	0.05
Copper	200.8	75-125	20	0.02
Iron	200.7	80-120	20	0.05
Gold	231.1	75-125	20	0.05
Lead	200.9	75-125	20	0.01
Lead	200.8	75-125	20	0.005
Organic Lead	LUFT	50-150	20	0.05
Lithium	SM3500L	80-120	20	0.05
Magnesium	200.7	80-120	20	1
Manganese	200.7	80-120	20	0.03

## Quality Assurance Objectives

TABLE 5-2 Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods

<u>CONSTITUENT</u>	<u>Method</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>mg/L</u>
Trace Metals continued				
Manganese	200.8	75-125	20	0.01
Mercury	245.1	75-125	20	0.0002
Mercury	245.2	75-125	20	0.0002
Molybdenum	200.7	80-120	20	0.05
Molybdenum	200.8	75-125	20	0.005
Nickel	200.7	80-120	20	0.05
Nickel	200.8	75-125	20	0.01
Potassium	200.7	80-120	20	1
Selenium	200.9	75-125	20	0.005
Selenium	200.8	75-125	20	0.02
Silica	200.7	80-120	20	1
Silver	200.9	75-125	20	0.01
Silver	200.8	75-125	20	0.005
Sodium	200.7	80-120	20	1
Strontium	200.7	80-120	20	0.05
Thallium	200.9	75-125	20	0.02
Thallium	200.8	75-125	20	0.005
Tin	200.9	75-125	20	0.05
Titanium	200.7	80-120	20	0.1
Uranium	200.7	80-120	20	0.1
Vanadium	200.7	80-120	20	0.02
Zinc	200.7	80-120	20	0.05
Zinc	200.8	75-125	20	0.05
<u>CONSTITUENT</u>	<u>Method</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>pCi/L</u>
Radiochemistry				
Gross Alpha	900.0	80-120	20	0.1
Gross Beta	900.0	80-120	20	0.1
Radon	913.0	80-120	20	10
Strontium 90	905.0	80-120	20	1
Total Radium	900.1	80-120	20	0.1
Tritium	906.0	80-120	20	200
Uranium	908.0	80-120	20	0.1

## Quality Assurance Objectives

TABLE 5-3 Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>mg/Kg</u>
Method EPA 8010			
Surrogates			
BFB	50-150	N/A	N/A
Fluorobenzene	50-150	N/A	N/A
Chlorofluorobenzene	50-150	N/A	N/A
Analytes			
Azobenzene	50-150	30	5
Benzidine	50-150	30	5
Benzoic acid	50-150	30	5
Benzylchloride	50-150	20	5
bis(2-Chloroisopropyl)ether	50-150	20	5
Bromobenzene	50-150	20	5
Bromochloromethane	50-150	20	5
Bromodichloromethane	42-172	20	5
Bromoform	13-159	20	5
Bromomethane	D-144	20	5
Carbon tetrachloride	43-143	20	5
Chlorobenzene	38-150	20	5
Chloroethane	46-137	20	5
Chloroform	49-133	20	5
1-Chlorohexane	50-150	20	5
Chloromethane	D-193	20	5
2-Chlorotoluene	50-150	20	5
Chlorotoluene	50-150	20	5
DBCP	50-150	20	5
Dibromochloromethane	24-191	20	5
1,2-Dibromoethane	50-150	20	5
Dibromomethane	50-150	20	5
1,2-Dichlorobenzene	D-208	20	5
1,3-Dichlorobenzene	7-187	20	5
1,4-Dichlorobenzene	42-143	20	5
1,1-Dichloroethane	47-132	20	5
1,2-Dichloroethane	51-147	20	5
1,1-Dichloroethylene	28-167	20	5
cis-1,2-Dichloroethylene	50-150	20	5
trans-1,2-Dichloroethylene	38-155	20	5
1,2-Dichloropropane	44-156	20	5
1,3-Dichloropropane	50-150	20	5
2,2-Dichloropropane	50-150	20	5
1,1-Dichloropropene	50-150	20	5
cis-1,3-Dichloropropene	22-178	20	5
trans-1,3-Dichloropropene	22-178	20	5
Hexachlorobutadiene	50-150	20	5
Methylene chloride	25-162	20	5
1,1,1,2-Tetrachloroethane	50-150	20	5
1,1,2,2-Tetrachloroethane	50-150	20	5
Tetrachloroethylene	26-162	20	5



## Quality Assurance Objectives

TABLE 5-3 Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>mg/Kg</u>
Method EPA 8010 continued			
1,2,3-Trichlorobenzene	50-150	20	5
1,2,4-Trichlorobenzene	50-150	20	5
1,1,1-Trichloroethane	41-138	20	5
1,1,2-Trichloroethane	39-136	20	5
Trichloroethylene	35-146	20	5
Trichlorofluoromethane	21-156	20	5
Trichloropropane	50-150	20	5
Vinyl chloride	28-163	20	5
Method EPA 8011			
EDB	50-150	30	0.0005
DBCP	50-150	30	0.0005
Method EPA 8015			
Acrylamide	50-150	40	0.05
Diethyl ether	50-150	40	0.05
Ethanol	50-150	40	0.05
Methyl ethyl ketone	50-150	40	0.05
Methyl isobutyl ketone	50-150	40	0.05
Paraldehyde	50-150	40	0.05
Method EPA 8015M TPH (purgeable)			
Gas	50-150	40	5
Method EPA 8015M TPH (extractable)			
Crude oil	50-150	40	10
Diesel fuel	50-150	40	10
Hydraulic oil	50-150	40	10
Jet fuel	50-150	40	10
Stoddard solvent	50-150	40	10
Waste oil	50-150	40	50
Method EPA 8020			
Benzene	39-159	20	0.003
Chlorobenzene	55-135	20	0.003
Ethylbenzene	32-160	20	0.003
1,2-Dichlorobenzene	37-154	20	0.003
1,3-Dichlorobenzene	50-141	20	0.003
1,4-Dichlorobenzene	42-143	20	0.003
Toluene	46-148	20	0.003
Xylene, o	50-150	20	0.003
Xylene, p	50-150	20	0.003
Xylene, m	50-150	20	0.003

## Quality Assurance Objectives

TABLE 5-3 Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>mg/Kg</u>
Method EPA 8040 (analyzed by method 8270)			
2-s-Butyl-4-6-dinitrophenol	50-150	30	0.1
2-Chlorophenol	23-134	30	0.1
4-Chloro-3-methylphenol	22-147	30	0.2
2,4-Dichlorophenol	39-135	30	0.1
2,4-Dimethylphenol	42-109	30	0.1
2,4-Dinitrophenol	D-191	30	0.5
2-Methyl-4,6-Dinitrophenol	D-181	30	0.5
2-Methylphenol	50-150	30	0.1
4-Methylphenol	50-150	30	0.1
2-Nitrophenol	29-182	30	0.1
4-Nitrophenol	29-182	30	0.5
Pentachlorophenol	14-176	30	0.5
Phenol	5-112	30	0.1
2,3,4,6-Tetrachlorophenol	50-150	30	0.1
2,3,5,6-Tetrachlorophenol	50-150	30	0.1
2,3,4-Trichlorophenol	37-144	30	0.1
2,3,5-Trichlorophenol	37-144	30	0.1
2,3,6-Trichlorophenol	37-144	30	0.1
2,4,5-Trichlorophenol	37-144	30	0.1
2,4,6-Trichlorophenol	37-144	30	0.1
Method EPA 8080			
Surrogates			
Hexachlorobenzene	50-150	30	N/A
Dibutylchloroendate	20-150	30	N/A
Analytes			
Aldrin	34-132	43	0.05
Alpha BHC	37-134	30	0.05
Beta BHC	17-147	30	0.05
Delta BHC	19-140	30	0.05
Chlordane	45-119	30	0.05
o,p - DDD	31-141	30	0.05
p,p - DDD	31-141	30	0.05
o,p - DDE	30-145	30	0.05
p,p - DDE	30-145	30	0.05
o,p - DDT	23-134	50	0.05
p,p - DDT	23-134	50	0.05
Dieldrin	31-134	38	0.05
Endosulfan I	45-153	30	0.05
Endosulfan II	D-202	30	0.05
Endosulfan sulfate	26-144	30	0.05
Endrin	42-139	45	0.05
Endrin aldehyde	50-150	30	0.05
Heptachlor	35-130	30	0.05
Heptachlor epoxide	37-142	30	0.05
Lindane	46-127	50	0.05

## Quality Assurance Objectives

TABLE 5-3 Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods

<u>CONSTITUENT</u>	<u>ACCURACY % REC-AR</u>	<u>PRECISION RPD-MAV</u>	<u>DLR mg/Kg</u>
Method EPA 8080 continued			
Methoxychlor	50-150	30	0.1
Toxaphene	41-126	30	0.1
PCB 1016	50-114	30	0.5
PCB 1221	15-178	30	0.5
PCB 1232	10-215	30	0.5
PCB 1242	39-150	30	0.5
PCB 1248	38-158	30	0.5
PCB 1254	29-131	30	0.5
PCB 1260	8-127	30	0.5
Method EPA 8140			
Surrogates			
1,3-Dimethyl-2-nitrobenzene	50-150	30	N/A
9-Nitroanthracene	50-150	30	N/A
Analytes			
Azinphos methyl	50-150	30	0.02
Bolstar	50-150	30	0.02
Chlorpyrifos	50-150	30	0.02
Coumaphos	50-150	30	0.02
Demeton-o,s	50-150	30	0.02
Diazinon	50-150	30	0.02
Dichlorvos	50-150	30	0.02
Disulfoton	50-150	30	0.02
Ethoprop	50-150	30	0.02
Fensulfoton	50-150	30	0.02
Fenthion	50-150	30	0.02
Merphos	50-150	30	0.02
Mevinphos	50-150	30	0.02
Naled	50-150	30	0.02
Parathion methyl	50-150	30	0.02
Phorate	50-150	30	0.02
Ronnel	50-150	30	0.02
Stirophos	50-150	30	0.02
Tokuthion	50-150	30	0.02
Trichlornate	50-150	30	0.02
Method EPA 8150			
Surrogate			
2,4-DCAA	30-150	N/A	N/A
Analytes			
Bentazon	30-150	30	0.2
Chloramben	30-150	30	0.1
2,4-D	30-150	30	1
Dalapon	30-150	30	0.1
2,4-DB	30-150	30	1
Dicamba	30-150	30	0.1

## Quality Assurance Objectives

TABLE 5-3 Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>mg/Kg</u>
Method EPA 8150 continued			
Dichlorprop	30-150	30	0.2
Dinoseb	30-150	30	0.1
Pentachlorophenol	30-150	30	0.1
Picloram	30-150	30	0.1
2,4,5-T	30-150	30	0.1
2,4,5-TP (Silvex)	30-150	30	0.2
Method EPA 8240			
Surrogates			
1,2-Dichloroethane-d4	61-164	N/A	N/A
Toluene-d8	81-117	N/A	N/A
BFB	67-124	N/A	N/A
Analytes			
Acetone	50-150	30	0.01
Acrolein	50-150	30	0.1
Acrylonitrile	50-150	30	0.1
Benzene	66-142	21	0.005
Bromodichloromethane	35-155	30	0.005
Bromoform	45-169	30	0.005
Bromomethane	D-242	30	0.01
Carbon disulfide	50-150	30	0.005
Carbon tetrachloride	70-140	30	0.005
Chlorobenzene	60-133	21	0.005
Chloroethane	14-230	30	0.01
2-Chloroethylvinyl ether	50-150	30	0.01
Chloroform	51-138	30	0.005
Chloromethane	D-273	30	0.01
Dibromochloromethane	53-149	30	0.005
1,2-Dichlorobenzene	50-150	30	0.005
1,3-Dichlorobenzene	50-150	30	0.005
1,4-Dichlorobenzene	50-150	30	0.005
Dichlorodifluoromethane	50-150	30	0.0005
1,1-Dichloroethane	59-172	21	0.005
1,2-Dichloroethane	49-155	30	0.005
1,1-Dichloroethylene	D-234	30	0.005
trans-1,2-Dichloroethylene	54-156	30	0.005
1,2-Dichloropropane	D-210	30	0.005
cis-1,3-Dichloropropene	D-227	30	0.005
trans-1,3-Dichloropropene	17-183	30	0.005
Ethanol	50-150	30	10
Ethylbenzene	37-162	30	0.005
2-Hexanone	50-150	30	0.005
Methylene chloride	D-221	30	0.005
2-Butanone (MEK)	50-150	30	0.01
4-Methyl-2-pentanone (MIBK)	50-150	30	0.005
Styrene	50-150	30	0.005



## Quality Assurance Objectives

TABLE 5-3 Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>mg/Kg</u>
Method EPA 8240 continued			
1,1,2,2-Tetrachloroethane	46-157	30	0.005
Tetrachloroethylene	64-148	30	0.005
Toluene	59-139	21	0.005
1,1,1-Trichloroethane	52-162	30	0.005
1,1,2-Trichloroethane	52-150	30	0.005
Trichloroethylene	62-137	24	0.005
Trichlorofluoromethane	17-181	30	0.005
Vinyl acetate	50-150	30	0.1
Vinyl chloride	D-251	30	0.01
Xylenes	50-150	30	0.005
Method EPA 8270			
Surrogates			
2-Fluorobiphenyl	30-115	30	N/A
Nitrobenzene-d5	23-120	30	N/A
p-Terphenyl-d14	18-137	30	N/A
2-Fluorophenol	25-121	30	N/A
Phenol-d6	24-113	30	N/A
2,4,6-Tribromophenol	19-122	30	N/A
Analytes			
Acenaphthene	31-137	19	1
Acenaphthylene	33-145	30	1
Aniline	50-150	30	5
Anthracene	27-133	30	1
Benzo(a)anthracene	33-143	30	1
Benzo(a)pyrene	17-163	30	1
Benzo(b)fluoranthene	24-159	30	1
Benzo(k)fluoranthene	11-162	30	1
Benzo(g,h,i)perylene	D-219	30	1
Benzylalcohol	50-150	30	2
bis(2-Chloroethoxy)methane	33-184	30	1
bis(2-Chloroethyl)ether	12-158	30	1
bis(2-Chloroisopropyl)ether	36-166	30	1
bis(2-Ethylhexyl)phthalate	29-137	30	1
4-Bromophenylphenylether	65-114	30	1
Butylbenzylphthalate	D-152	30	1
Chloroaniline	50-150	30	2
Chloronaphthalene	60-180	30	1
Chlorophenylphenylether	25-158	30	1
Chrysene	17-168	30	1
Dibenzo(a,h)anthracene	D-227	30	1
Dibenzofuran	50-150	30	1
1,2-Dichlorobenzene	32-129	30	1
1,3-Dichlorobenzene	D-172	30	1
1,4-Dichlorobenzene	28-104	27	1
3,3'-Dichlorobenzidine	8-213	30	2

## Quality Assurance Objectives

TABLE 5-3 Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>mg/Kg</u>
Method EPA 8270 continued			
Diethylphthalate	D-114	30	1
Dimethylphthalate	D-112	30	1
Di-n-butylphthalate	1-118	30	1
2,4-Dinitrotoluene	28-100	47	1
2,6-Dinitrotoluene	50-158	30	1
Di-n-octylphthalate	4-146	30	1
Fluoranthene	26-137	30	1
Fluorene	59-121	30	1
Hexachlorobenzene	50-150	30	1
Hexachlorobutadiene	24-116	30	1
Hexachlorocyclopentadiene	50-150	30	2
Hexachloroethane	40-113	30	1
Indeno(1,2,3-c,d)pyrene	50-150	30	1
Isophorone	21-196	30	1
2-Methylnaphthalene	50-150	30	1
Naphthalene	21-133	30	1
Nitrobenzene	35-180	30	1
N-Nitrosodimethylamine	50-150	30	1
N-Nitrosodi-N-propylamine	41-126	38	1
N-Nitrosodiphenylamine	50-150	30	1
2-Nitroaniline	50-150	30	5
3-Nitroaniline	50-150	30	5
4-Nitroaniline	50-150	30	5
Phenanthrene	54-120	30	1
Pyrene	35-142	36	1
1,2,4-Trichlorobenzene	38-107	23	1
2-Chlorophenol	25-102	50	1
2,4-Dichlorophenol	39-135	30	1
2,4-Dimethylphenol	42-109	30	1
4,6-Dinitro-o-cresol	D-181	30	5
2,4-Dinitrophenol	D-191	30	5
2-Methylphenol	50-150	30	1
4-Methylphenol	50-150	30	1
2-Nitrophenol	29-182	30	1
4-Nitrophenol	11-114	50	5
p-Chloro-m-cresol	26-103	33	2
Pentachlorophenol	17-109	47	5
Phenol	26-90	35	1
2,4,5-Trichlorophenol	50-150	30	1
2,4,6-Trichlorophenol	37-144	30	1
Azobenzene	50-150	30	5
Benzidine	50-150	30	5
Benzoic Acid	50-150	30	5

## Quality Assurance Objectives

TABLE 5-3 Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods

<u>CONSTITUENT</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>ug/Kg</u>
Method EPA 8310			
Acenaphthene	70-130	20	3
Acenaphthylene	70-130	20	2
Anthracene	70-130	20	0.1
Benzo(a)anthracene	70-130	20	0.1
Benzo(b)fluoranthene	70-130	20	0.2
Benzo(k)fluoranthene	70-130	20	0.1
Benzo(g,h,i)perylene	70-130	20	0.1
Benzo(a)pyrene	70-130	20	0.2
Chrysene	70-130	20	0.1
Dibenzo(a,h)anthracene	70-130	20	0.3
Fluoranthene	70-130	20	2
Fluorene	70-130	20	2
Indeno(1,2,3-c,d)pyrene	70-130	20	0.1
Naphthalene	70-130	20	2
Phenanthrene	70-130	20	2
Pyrene	70-130	20	0.1

### Method EPA 9060

TOC	80-120	20	50
-----	--------	----	----

### Method EPA 9020

TOX	80-120	20	1
-----	--------	----	---

### EPA Method 418.1M

TRPH-By IR	50-150	20	10
------------	--------	----	----

<u>CONSTITUENT</u>	<u>Method</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>mg/Kg</u>
Inorganic Chemicals				
Chloride	9056	70-130	30	10
Electrical Conductivity	120.1	80-120	20	10 umhos
Cyanide, Total	335.2	65-135	30	1
Fluoride	335.2	65-135	30	50
Moisture	ASA/UL	N/A	20	N/A
Nitrogen				
Ammonia-N	350.1	70-130	30	4
Nitrate	9056	70-130	30	4
Nitrite	9056	70-130	30	3
Organic	Calc.	N/A	30	100
Kjeldahl	351.1	65-135	30	100
Total	Calc.	N/A	30	100
Oil and Grease, Soxhlet	413.1	N/A	30	200
pH	150.1	N/A	20	N/A
Phenols	420.1	65-135	30	5

## Quality Assurance Objectives

TABLE 5-3 Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods

CONSTITUENT	Method	DLR	ACCURACY	PRECISION
		% REC-AR	RPD-MAV	mg/Kg
Inorganic Chemicals				
Phosphorous				
Phosphate	9056	70-130	30	3
Total (see Trace Metals)				
Sulfate	9056	70-130	30	10
Sulfide	376.2	N/A	30	5
Hazardous Waste Characterization				
Corrosivity (pH)	9045	20.0	N/A	N/A
Ignitability	1020	N/A	N/A	N/A
Reactivity	SW-846	N/A	N/A	N/A
Generation	SW-846	N/A	N/A	N/A
Trace Metals				
Aluminum	6010	70-130	30	50
Aluminum	6020	70-130	30	20
Antimony	7041	65-135	30	3
Antimony	6020	65-135	30	1
Arsenic	7060	65-135	30	1
Arsenic	6020	65-135	30	4
Barium	6010	70-130	30	1
Barium	6020	70-130	30	1
Beryllium	6010	70-130	30	0.5
Beryllium	6020	70-130	30	1
Boron	6010	70-130	30	5
Boron	6020	70-130	30	5
Cadmium	6010	70-130	30	3
Cadmium	6020	70-130	30	1
Calcium	6010	70-130	30	50
Chromium	6010	70-130	30	3
Chromium	6020	70-130	30	4
Chromium VI	7196	D-130	30	0.2
Cobalt	6010	70-130	30	3
Cobalt	6020	70-130	30	4
Copper	6010	70-130	30	3
Copper	6020	70-130	30	4
Gold	231.1	70-130	30	3
Iron	6010	70-130	30	3
Lead	7420	70-130	30	4
Lead	6020	70-130	30	1
Organic Lead	LUFT	50-150	20	4
Lithium	7430	70-130	30	3
Magnesium	6010	70-130	30	50
Manganese	6010	70-130	30	2
Manganese	6020	70-130	30	2
Mercury	7471	65-135	30	0.01

## Quality Assurance Objectives

TABLE 5-3 Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods

<u>CONSTITUENT</u>	<u>Methods</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>mg/Kg</u>
Trace Metals continued				
Molybdenum	6010	70-130	30	3
Molybdenum	6020	70-130	30	1
Nickel	6010	70-130	30	3
Nickel	6020	70-130	30	2
Phosphorous, Total	6010	65-135	30	50
Potassium	6010	70-130	30	50
Selenium	7740	65-135	30	3
Selenium	6020	65-135	30	4
Silver	6010	70-130	30	3
Silver	6020	70-130	30	1
Sodium	6010	70-130	30	50
Strontium	6010	65-135	30	3
Thallium	7841	65-135	30	3
Thallium	6020	65-135	30	1
Tin	6010	65-135	30	3
Titanium	6010	65-135	30	5
Uranium	6010	65-135	30	5
Vanadium	6010	70-130	30	1
Zinc	6010	70-130	30	3
Zinc	6020	70-130	30	10
<u>CONSTITUENT</u>	<u>Method</u>	<u>ACCURACY</u> <u>% REC-AR</u>	<u>PRECISION</u> <u>RPD-MAV</u>	<u>DLR</u> <u>pCi/Kg</u>
Radiochemistry				
Gross Alpha	900.0	80-120	20	1
Gross Beta	900.0	80-120	20	1
Radon	913.0	80-120	20	10
Strontium 90	905.0	80-120	20	1
Total Radium	900.1	80-120	20	1
Tritium	906.0	80-120	20	200
Uranium	908.0	80-120	20	1



## Sampling Procedures

Sample collection and sample handling techniques are important aspects of the overall sample analysis process and have a major impact on the quality and validity of the results. Specific containers and preservatives are used to ensure that sample integrity is not lost through volatility or degradation. In addition, contaminants that are likely to interfere or effect the quality of analytical data must be minimized or eliminated. If a client chooses to collect their own samples, experienced lab staff can brief clients by telephone on the proper methods of sample collection. Detailed procedures to ensure sampling consistency and compliance with method requirements are available. The correct container types, bottle sizes, preservatives, container closures, and holding times for sampling are shown in Table 6-1.

### 6.1 FGL Sampling Protocols

#### 6.1.1 General Precautions

The result of any analytical determination can be no better than the sample on which it is performed. The objective is to obtain a sample that meets the requirements of the sampling program and manage it in such a way that it does not deteriorate or become contaminated before reaching the laboratory. This objective implies that the relative proportions or concentrations of all pertinent components will be the same in the samples as in the material being sampled, and that the sample will be processed in such a way that no significant changes in composition occur before the tests are made.

A sample may be presented to the laboratory for specific determinations with the collector taking responsibility for its validity. Often the laboratory conducts or prescribes the sampling program which is determined in consultation with the user of the test results. Such consultation is essential to insure the selection of the appropriate sample and analytical methods that provide a true basis for answering the questions that prompted the sampling.

Before filling, rinse the sample bottle two or three times with the water being collected, unless the bottle contains a preservative. Depending on determinations to be performed, fill container full (most organics determinations) or leave space for aeration, mixing, etc. (microbiological analyses). For samples that will be shipped, preferably leave an air space of about one (1) percent of container capacity to allow for thermal expansion. Special precautions are necessary for samples containing organic compounds and trace metals. Because many constituents may be present at concentrations of micrograms per liter, they may be totally or partially lost if proper sampling and preservation procedures are not followed.

Representative samples of some sources can be obtained only by making composites of samples collected over a period of time or at many different sampling points. The details of collection vary so much with local conditions that no specific recommendations would be universally applicable. Sometimes it is more informative to analyze numerous separate samples instead of one composite so as not to obscure high and low results.

Sample carefully to insure that analytical results represent the actual sample composition. Important factors affecting results are; the presence of suspended matter or turbidity; the method chosen for its removal, and; the physical and chemical changes brought about by storage or aeration.

## **Sampling Procedures**

### **6.1.1 General Precautions continued**

Particular care is required when processing (grinding, blending, sieving, filtering) samples to be analyzed for trace constituents, especially metals and organic compounds. Some determinations, particularly of lead, can be invalidated by contamination from such processing.

Treat each sample individually with regard to the substances to be determined, the amount and nature of turbidity present, and other conditions that may influence the results.

It is impractical to give directions covering all conditions. The choice of technique for collecting a homogeneous sample must be left to the analyst's judgment. In general, separate any significant amount of suspended matter by decantation, centrifugation, or an appropriate filtration procedure. Often a slight turbidity can be tolerated if experience shows that it will cause no interference in gravimetric or volumetric tests. Its influence can be corrected in colorimetric tests, where it has potentially the greatest interfering effect. When relevant, state whether or not the sample has been filtered. To measure the total amount of a constituent, do not remove suspended solids, but treat them appropriately.

Make a record of every sample collected and identify every bottle, preferably by attaching an appropriately inscribed tag or label. Record sufficient information to provide positive sample identification at a later date. Include the name of the sample collector, the date, hour, and exact location, the water temperature, and any other data that may be needed for correlation, such as weather conditions, water level, stream flow, post-sampling handling, etc. Provide space on the label for the initials of those assuming sample custody and for the time and date of transfer. Identify sampling points by detailed description, by maps, or with the aid of stakes, buoys, or landmarks in a manner that will permit their identification by other persons without reliance on memory or personal guidance. When sample results are expected to be involved in litigation, it is recommended to use formal "chain-of-custody" procedures which trace sample history from collection to final reporting.

Hot samples collected under pressure should be cooled while still under pressure.

Before collecting samples from distribution systems, flush lines sufficiently to insure that the sample is representative of the supply, taking into account the diameter and length of the pipe to be flushed and the velocity of flow.

Collect samples from wells only after the well has been pumped sufficiently to insure that the sample represents the groundwater source. Sometimes it will be necessary to pump at a specified rate to achieve a characteristic drawdown, if this determines the zones from which the well is supplied. Record pumping rate and drawdown.

When samples are collected from a river or stream, observed results may vary with depth, stream flow, and distance from shore and from one shore to the other. If equipment is available, take an "integrated" sample from top to bottom in the middle of the stream or from side to side at mid-depth.



## **Sampling Procedures**

### **6.1.1 General Precautions continued**

Lakes and reservoirs are subject to considerable variations from normal causes such as seasonal stratification, rainfall, runoff, and wind. Choose location, depth, and frequency of sampling to reflect local conditions and the purpose of the investigation. Avoid surface scum.

For certain constituents, sampling location is extremely important. Avoid areas of excessive turbulence because of potential loss of volatile constituents and of potential presence of toxic vapors. Avoid sampling at weirs because such locations tend to favor retrieval of lighter-than-water, immiscible compounds. Generally, collect samples beneath the surface in quiescent areas. If composite samples are required, take care that sample constituents are not lost during compositing because of improper handling of the sample being pooled. For example, casual dumping together of portions rather than addition to the composite through a submerged siphon can cause unnecessary volatilization.

Use only representative samples (or those conforming to a sampling program) for examination. The great variety of conditions under which collections must be made makes it impossible to prescribe a fixed procedure. In general, take into account the tests or analyses to be made and the purpose for which the results are needed.

### **6.1.2 Field Notebook**

The sampler or field investigator should keep a field notebook (preferably bound with pages numbered) to record sample collection procedures, dates, laboratory identification, sample collection location, and the name of the sampler. This is important for later recall or legal challenge.

## **6.2 Water Samples**

### **6.2.1 Grab or Catch Samples**

Strictly speaking, a sample collected at a particular time and place can represent only the composition of the source at that time and place. However, when a source is known to be fairly constant in composition over a considerable period of time or over substantial distances in all directions, then the sample may be said to represent a longer time period or a larger volume, or both, than the specific point at which it was collected. In such circumstances, some sources may be fairly represented by single grab samples. Examples are some water supplies, some surface waters, and rarely, some wastewater streams. When a source is known to vary with time, grab samples collected at suitable intervals and analyzed separately can document the extent, frequency, and duration of these variations. Choose sampling intervals on the basis of the frequency with which changes may be expected, which may vary from as little as five (5) minutes to as long as one (1) hour or more. Seasonal variations in natural systems may necessitate sampling over months. When the source composition varies in space rather than time, collect samples from appropriate locations.

Use great care in sampling wastewater, sludges, sludge banks, and muds. No definite procedure can be given, but take every possible precaution to obtain a representative sample or one conforming to a sampling program.

## **Sampling Procedures**

### **6.2.2 Composite Samples**

In most cases, the term "composite sample" refers to a mixture of grab samples collected at the same sampling point at different times. Sometimes the term "time-composite" is used to distinguish this type of sample from others. Time-composite samples are most useful for observing average concentrations that will be used, for example, in calculating the loading or the efficiency of a wastewater treatment plant. As an alternative to the separate analysis of a large number of samples and the computation of average and total results, composite samples represent a substantial saving in laboratory effort and expense. For these purposes, a composite sample representing a 24 hour period is considered standard for most determinations. Under certain circumstances, however, a composite sample representing one shift, or a shorter time period, or a complete cycle of a periodic operation, may be preferable. To evaluate the effects of special, variable, or irregular discharges and operations, collect composite samples representing the period during which such discharges occur.

For determining components or characteristics subject to significant and unavoidable changes on storage, do not use composite samples. Make such determinations on individual samples as soon as possible after collection and preferably at the sampling point. Analyses for all dissolved gases, residual chlorine, soluble sulfide, temperature, and pH are examples of this type of determination. Changes in such components as dissolved oxygen or carbon dioxide, pH, or temperature may produce secondary changes in certain inorganic constituents such as iron, manganese, alkalinity, or hardness. Use time-composite samples only for determining components that can be demonstrated to remain unchanged under the conditions of sample collection and preservation.

Take individual portions in a bottle having a diameter of at least 35 mm at the mouth and a capacity of at least 120 mL. Collect these portions every hour, in some cases every half hour or even every five (5) minutes, and mix at the end of the sampling period or combine in a single bottle as collected. If preservatives are used, add them to the sample bottle initially so that all portions of the composite are preserved as soon as collected. Analysis of individual samples sometimes may be necessary. It is desirable, and often essential, to combine individual samples in volumes proportional to flow. A final sample volume of 2 to 3 L is sufficient for sewage, effluents, and wastes.

Automatic sampling devices are available; however, do not use them unless the sample is preserved as described below. Clean sampling devices, including bottles, daily to eliminate biological growths and other deposits.

### **6.2.3 Integrated Samples**

For certain purposes, the information needed is provided best by analyzing mixtures of grab samples collected from different points simultaneously, or as nearly so as possible. Such mixtures sometimes are called integrated samples. An example of the need for such sampling occurs in a river or stream that varies in composition across its width and depth. To evaluate average composition or total loading, use a mixture of samples representing various points in the cross-section, in proportion to their relative flows. The need for integrated samples also may exist if combined treatment is proposed for several separate wastewater streams, the interaction of which may have a significant effect on treatability or even on composition. Mathematical prediction of the interactions may be inaccurate or impossible and testing a suitable integrated sample may provide more useful information.

## Sampling Procedures

### 6.2.3 Integrated Samples continued

Both natural and artificial lakes show variations of composition with both depth and horizontal location. However, under many conditions, neither total nor average results are especially significant; local variations are more important. In such cases, examine samples separately rather than integrate them.

Preparation of integrated samples usually requires special equipment to collect a sample from a known depth without contaminating it with overlying water. Knowledge of the volume, movement, and composition of the various parts of the water being sampled usually is required. Therefore, collecting integrated samples is a complicated and specialized process that cannot be described in detail.

### 6.3 Hazardous Waste Samples

#### 6.3.1 Volatile Organics

Standard 40 mL glass screw-cap VOA vials with Teflon-faced silicone septum may be used for both liquid and solid matrices. The vials and septum should be soap and water washed and rinsed with distilled deionized water. After thoroughly cleaning the vials and septum, they should be placed in a muffle furnace and dried at 150 C for approximately one hour. (Note: Do not heat the septum for extended periods of time, i.e., more than one hour, because the silicone begins to slowly degrade at 105 C).

When collecting the samples, liquids and solids should be introduced into the vials gently to reduce agitation which might drive off volatile compounds. Liquid samples should be poured into the vial without introducing any air bubbles within the vial as it is being filled. Should bubbling occur as a result of violent pouring, the sample must be poured out and the vial refilled. Each VOA vial should be filled until there is a meniscus over the lip of the vial. The screw-top lid with the septum (Teflon side toward the sample) should then be tightened onto the vial. After tightening the lid, the vial should be inverted and tapped to check for air bubbles. If there are any air bubbles present the sample must be retaken. Two VOA vials should be filled per sample location.

VOA vials for samples with solid or semi-solid (sludges) matrices should be completely filled as best as possible. The vials should be tapped slightly as they are filled to eliminate as much free air space as possible. Two vials should also be filled per sample location.

VOA vials should be filled and labeled immediately at the point at which the sample is collected. They should NOT be filled near a running motor or any type of exhaust system because discharged fumes and vapors may contaminate the samples. The two vials from each sampling location should then be sealed in separate plastic bags to prevent cross-contamination between samples particularly if the sampled waste is suspected of containing high levels of volatile organics. (Activated carbon may also be included in the bags to prevent cross-contamination from highly contaminated samples). VOA samples may also be contaminated by diffusion of volatile organics through the septum during shipment and storage. To monitor possible contamination, a trip blank prepared from distilled deionized water should be carried throughout the sampling, storage, and shipping process.

## **Sampling Procedures**

### **6.3.2 Semivolatile Organics**

(This includes Pesticides and Herbicides) Containers used to collect samples for the determination of semivolatile organic compounds should be soap and water washed followed by methanol (or isopropanol) rinsing. The sample containers should be of glass or Teflon and have screw-top covers with Teflon liners. In situations where Teflon is not available, samples may react with the aluminum foil, causing eventual contamination of the sample. Plastic containers or lids may NOT be used for the storage of samples due to the possibility of sample contamination from the phthalate esters and other hydrocarbons within the plastic. Sample containers should be filled with care so as to prevent any portion of the collected sample coming in contact with the field persons gloves, thus causing contamination. Samples should not be collected or stored in the presence of exhaust fumes. If the sample comes in contact with the an automatic sampler run reagent water through the sampler and use as a field blank.

### **6.3.3 Trace Metals**

In the determination of trace metals, containers can introduce either positive or negative errors in the measurement of trace metals by (a) contributing contaminants through leaching or surface desorption, and (b) depleting concentrations through adsorption. Thus the collection and treatment of the sample prior to analysis require particular attention.

## **6.4 Underground Storage Tank Samples**

### **6.4.2 Soil Samples**

#### **6.4.2.1 Hydrocarbons**

Soil samples collected from a backhoe, the ground or a soil coring device, should be collected in a thin-walled stainless steel or brass cylinder at least three inches long by one inch in diameter that has been prepared by the laboratory doing the analysis or the project consultant (cylinders can be made to fit inside the preferred split-barrel core sampler). About one inch of soil should be removed from the immediate surface area where the sample is to be taken and the cylinder then pounded in to the soil with a mallet or hammer. No headspace should be present in the cylinder once the sample is collected. When the sample is collected, each end of the cylinder should be covered with teflon tape and then capped with a polyethylene lid, taped and labeled. The sample should be immediately placed in an ice chest and kept cool at 4 C for delivery to the laboratory. Care should be taken throughout, to avoid contamination of both the inside and outside of the cylinder and its contents.

Samples should be kept cool at 4 C at the laboratory until they are analyzed. Holding times should not exceed 14 days from the time of collection. A portion of the sample should be removed and prepared for analysis according to approved EPA methods.

In situations where the above procedure is inappropriate (i.e. semi-solid samples), glass vials (properly prepared by contract laboratory consultant) with Teflon seal and screw cap should be used and maintained at 4 C until analysis.

#### **6.4.2.2 Organic Lead**

Tetraethyl/tetramethyl-lead are volatile; therefore, soil samples should be collected in cylinders and frozen as described for volatile hydrocarbons above.

## **Sampling Procedures**

### **6.4.2.3 Product Samples**

**Free Floating Product (from a well):** Sampling of free floating product on the surface of ground water should not be performed until the well has been allowed to stabilize for at least 24 hours after development or other withdrawal procedure. A sample should be collected that is indicative of the thickness of floating product within the monitoring well. This may be accomplished by the use of a clear, acrylic bailer designed to collect a liquid sample where free product and ground water meet. A graduated scale on the bailer is helpful for determining the thickness of free product. Samples should be field-inspected for the presence of odor and/or sheen in addition to the above evaluation.

Electronic measuring devices also are available for determining the thickness of the hydrocarbon layer floating on ground water.

### **6.4.2.4 Aqueous/Dissolved Product**

If free product (from a well) is detected, analysis of water for dissolved product should be conducted after the free product has been substantially removed from the well. Before collecting a water sample, a well should be purged until temperature, conductivity and pH stabilize. Often, this will require removal of four or more well volumes by bailing or pumping. Once well volumes are removed and well water is stabilized, a sample can be taken after the water level approaches 80 percent of its initial level. Where water level recovery is slow, the sample can be collected after stabilization is achieved.

Ground water samples should be collected in a manner which reduces or eliminates the possibility of loss of volatile constituents from the sample. For collecting samples, a gas-actuated positive displacement pump or a submersible pump is preferred. A Teflon or stainless steel bailer is acceptable. Peristaltic pumps or airlift pumps should not be used.

Cross-contamination from transferring pumps (or bailers) from well to well can occur and should be avoided by thorough cleaning between sampling episodes. Dedicated (i.e., permanent installation) well pumps, while expensive, are often cost effective in the long term and ensure data reliability relative to cross-contamination. If transfer of equipment is necessary, sampling should proceed from the least contaminated to the most contaminated well, if the latter information is available before sample collection.

Water samples should be collected in vials or containers specifically designed to prevent loss of volatile constituents from the sample. These vials should be provided by an analytical laboratory, and preferably, the laboratory conducting the analysis. No headspace should be present in the sample container once the container has been capped. This can be checked by inverting the bottle, once the sample is collected, and looking for bubbles. Sometimes it is not possible to collect a sample without air bubbles, particularly if water is aerated. In these cases, the investigator should record the problem and account for probable error. Cooling samples may also produce headspace (bubbles), but these will disappear once the sample is warmed for analysis.

Samples should be placed in an ice chest maintained at 4 C with blue ice (care should be taken to prevent freezing of the water and bursting of the glass vial). A thermometer with a protected bulb should be carried in each ice chest.

## **Sampling Procedures**

### **6.4.2.5 Surface Water**

Grab samples should be collected in appropriate glass containers supplied by the laboratory. The sample should be collected in such a manner that air bubbles are not entrapped. Semisolid samples should be collected the same way. The collected samples should be refrigerated (blue ice, 4 C) for transport and analyzed within seven (7) days of collection (14 days with preservatives).

### **6.5 Pesticide Residue Sampling Procedures**

#### **6.5.1 Concerning Re-entry and Worker Safety**

All samples should be from the plant foliage (leaf tissue) when pesticides are applied to the foliage. Sometimes areas other than the plant foliage may be in question, such as the dripline area surface soil and/or the leaf duff (leaf litter) under the trees. The sample should be large enough to fill a normal "lunch bag" and be taken from several plantings.

#### **6.5.2 Concerning Consumer Safety**

The edible portion of the plant or fruit should be collected. The sample should contain approximately one (1) pound of material taken from several plants. Usually six to eight whole plants or fruit pieces will make up a good sample.

### **6.6 Sample Handling Policy**

Proper sample containers, sample volumes, preservatives, and holding times are essential to providing reliable data. Table 6-1 provides information for each of these items. FGL references the following sources for compiling Table 6-1.

- (1) Federal Register, Volume 49, No. 209, October 26, 1984 and subsequent updates.
- (2) "Handbook for Sampling and Sample Preservation of Water and Wastewater", EPA Method Book, EPA-600/4-82-029, September 1982.
- (3) "Methods for Chemical Analysis in Waters and Waste" (MCAWW) EPA-600/4-79-020
- (4) "Methods for Evaluating Solid Waste", EPA Method Book, SW- 846, rev. 3, and Proposed Revisions.
- (5) "Standard Methods for the Analysis of Water and Wastewater", 17th Edition, 1990.
- (6) "Methods for the Determination of Organic Compounds in Drinking Water", EPA Method Book, EPA-600/4-88-039, December 1988.
- (7) "Methods for the Determination of Organic Compounds in Drinking Water-Supplement I", EPA Method Book, EPA-600/4- 90-020, July 1990.
- (8) "Methods for the Determination of Organic Compounds in Drinking Water-Supplement II", EPA Method Book, EPA-600/4- 90-020, July 1990.
- (9) "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater", EPA Method Book, EPA 600/4-82-057, July 1982.
- (10) "Prescribed Procedures for Measurement of Radioactivity in Drinking Water", EPA Method Book, EPA-600/4-80-032, August 1980.

#### **6.6.1 Bottle Preparation**

Sample bottles for most analyses, such as metals, and organics analyses, are purchased precleaned according to EPA Protocol specification from various vendors. In addition to manufacturer certified containers, FGL monitors sample containers for specific contaminants as each lot is received. Bottles are carefully wrapped to prevent breakage during shipment.

## **Sampling Procedures**

### **6.6.2 Shipping Samples**

Prior to shipment of samples, all documentation must be ready for proper chain of custody. The information necessary for documenting chain of custody is outlined in the following section of the quality assurance manual (section 7). After filling out the proper sample documentation, the samples and documents should be placed in an ice chest with adequate protection. Normally "Blue Ice" is used for keeping samples cool. However, dry ice may be used if approved by Department of Transportation (DOT).

### **6.6.3 Sample Kits**

FGL Environmental supplies the appropriate sample containers, preservatives, chain-of-custody forms, coolers with blue ice, and packing materials to client upon request. There is no charge for these services as long as FGL is the laboratory receiving the samples for analysis. Arrangements for sample kits may be made through the client services department.

## Sampling Procedures

TABLE 6-1 RECOMMENDED SAMPLE COLLECTION AND PRESERVATION

<u>Analysis</u>	<u>Container</u>	<u>Volume (mL)</u>	<u>Preservation</u>	<u>Holding Time</u>
<b>General Inorganic Chemistry</b>				
Acidity	P,G	250	Cool, 4 C	14 days
Alkalinity	P,G	250	Cool, 4 C	14 days
Asbestos	G	1000	Cool, 4 C	48 hr.
Bicarbonate	P	250	Cool, 4 C	14 days
Biochemical Oxygen Demand	P,G	1000	Cool, 4 C	48 hr.
Boron	P	250	Cool, 4 C	6 mo.
Bromide	P	250	Cool, 4 C	28 days
Carbonate	P	250	Cool, 4 C	14 days
Carbon Dioxide	P,G	250	Cool, 4 C	immed.
Chemical Oxygen Demand	P,G	250	H <sub>2</sub> SO <sub>4</sub> , pH < 2; Cool, 4 C	28 days
Chloride	P,G	250	Cool, 4 C	28 days
Chlorine Residual	P,G	500	Cool, 4 C	2 hr.
Chlorine Demand	P,G	2000	Cool, 4 C	2 hr.
Color	P,G	250	Cool, 4 C	48 hr.
Cyanide, Total	P,G	1000	NaOH, pH > 12; Cool, 4 C	14 days
Electrical Conductivity	P	250	Cool, 4 C	28 days
Fluoride	P,G	250	Cool, 4 C	28 days
Hardness, Total	P,G	250	HNO <sub>3</sub> , pH < 2; Cool, 4 C	6 mo.
Hydroxide	P,G	250	Cool, 4 C	14 days
Iodide	P,G	250	Cool, 4 C	24 hr.
Langelier Index	P,G	500	Cool, 4 C	2 hr.
MBAS	P,G	500	Cool, 4 C	48 hr.
Nitrogen,				
Ammonia	P,G	250	H <sub>2</sub> SO <sub>4</sub> , pH < 2; Cool, 4 C	28 days
Nitrate + Nitrite	P,G	250	H <sub>2</sub> SO <sub>4</sub> , pH < 2; Cool, 4 C	28 days
Nitrate	P,G	250	Cool, 4 C	48 hr.
Nitrite	P,G	250	Cool, 4 C	48 hr.
Organic	P,G	400	H <sub>2</sub> SO <sub>4</sub> , pH < 2; Cool, 4 C	28 days
Total	P,G	250	H <sub>2</sub> SO <sub>4</sub> , pH < 2; Cool, 4 C	28 days
Total Kjeldahl	P,G	250	H <sub>2</sub> SO <sub>4</sub> , pH < 2; Cool, 4 C	28 days
Odor	G	500	Cool, 4 C	24 hr.
Oil and Grease	G	1000	H <sub>2</sub> SO <sub>4</sub> , pH < 2; Cool, 4 C	28 days
Oxygen, Dissolved	G	250	Cool, 4 C	immed.
	w/glass stopper			
pH	P,G	250	Cool, 4 C	2 hr.
Phenolics	G	500	H <sub>2</sub> SO <sub>4</sub> , pH < 2; Cool, 4 C	28 days

P = plastic, G = glass

Note: All solid samples should be collected in stainless steel sleeves, brass sleeves or in glass jars all with teflon-lined caps and 4-8 oz. capacity. All solid samples should be kept cool at 4 C.



## Sampling Procedures

TABLE 6-1 RECOMMENDED SAMPLE COLLECTION AND PRESERVATION

<u>Analysis</u>	<u>Container</u>	<u>Volume (mL)</u>	<u>Preservation</u>	<u>Holding Time</u>
General Inorganic Chemistry continued				
Phosphorus				
Ortho/dissolved	P,G	250	Cool, 4 C	48 hr.
Total	P,G	250	H <sub>2</sub> SO <sub>4</sub> , pH < 2; Cool, 4 C	28 days
Resistivity	P	250	Cool, 4 C	28 days
Silica	P	250	Cool, 4 C	28 days
Sodium Absorption Ratio	P	250	HNO <sub>3</sub> , pH < 2	6 mo.
Solids,				
Filterable	P,G	250	Cool, 4 C	7 days
Non-filterable	P,G	250	Cool, 4 C	7 days
Total	P,G	250	Cool, 4 C	7 days
Volatile	P,G	250	Cool, 4 C	7 days
Settleable	P,G	1000	Cool, 4 C	48 hr.
Sulfate	P,G	250	Cool, 4 C	28 days
Sulfide				
Total	P,G	500	2 ml ZnAcetate + NaOH, pH > 9	7 days
Dissolved	P,G	500	NaOH, pH > 9	24 hr.
Tannin & Lignin	G	250		
Titration - pH adjustment	P,G	250	Cool, 4 C	14 days
Turbidity	P,G	250	Cool, 4 C	48 hr.
Trace Metals				
Chromium VI	P,G	500	Cool, 4 C	24 hr.
Mercury	P,G	500	HNO <sub>3</sub> , pH < 2	28 days
All other metals	P	500	HNO <sub>3</sub> , pH < 2	6 mo.

P = plastic, G = glass

\* No headspace over sample

\*\* For non-preserved samples, the holding time is 5 days. For preserved samples, please provide either a non-preserved sample (100 mL) or the electrical conductivity prior to acidification.

Note: All solid samples should be collected in stainless steel sleeves, brass sleeves or in glass jars all with teflon-lined caps and 4-8 oz. capacity. All solid samples should be kept cool at 4 C.

## Sampling Procedures

TABLE 6-1 RECOMMENDED SAMPLE COLLECTION AND PRESERVATION

<u>Analysis</u>	<u>Container</u>	<u>Volume (mL)</u>	<u>Preservation</u>	<u>Holding Time</u>
Radiochemistry				
Gross Alpha & Beta	P	1000	HNO <sub>3</sub> , pH < 2	6 mo.
Total Radium	P	1000	HNO <sub>3</sub> , pH < 2	6 mo.
Total Uranium	P	1000	HCl, pH < 2	6 mo.
Radon*	G	2x250	Cool, 4 C	72 hr.
Tritium	G	2x250	Cool, 4 C	6 mo.
Strontium 90	P	1000	HCl, pH < 2	6 mo.

All Bacteriological	P,G	100	0.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> ; Cool, 4 C, Sterile	30 hr.
---------------------	-----	-----	--	--------

<u>Analysis</u>	<u>Container</u>	<u>Volume (mL)</u>	<u>Preservation</u>	<u>Holding Time</u>
-----------------	------------------	--------------------	---------------------	---------------------

### Organic Chemicals

#### Drinking Water

EPA 501*	G, VOA TFE-septa cap	2 x 40	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated HCl, pH < 2; Cool, 4 C	14 days
EPA 502.2*	G, VOA TFE-septa cap	2 x 40	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated HCl pH < 2; Cool, 4 C	14 days
EPA 504*	G TFE-septa cap	2 x 40	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated Cool, 4 C	28 days
EPA 505**	G TFE-septa cap	2 x 40	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated Cool, 4 C	7 days
EPA 507	G, amber TFE-lined cap	1 x 1000	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated or HCl pH < 2; Cool, 4 C	14 days
EPA 508**	G, amber TFE-lined cap	1 x 1000	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated Cool, 4 C	7 days
EPA 510*	G, amber TFE-septa cap	1 x 250	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated Cool, 4 C	14 days

\* No head space over sample.

\*\* This is the maximum holding time prior to extraction. The extracted sample may be held up to 40 days before analysis.

## Sampling Procedures

TABLE 6-1 RECOMMENDED SAMPLE COLLECTION AND PRESERVATION

<u>Analysis</u>	<u>Container</u>	<u>Volume (mL)</u>	<u>Preservation</u>	<u>Holding Time</u>
Organic Chemicals				
<u>Drinking Water</u>				
EPA 515.1**	G, amber TFE-lined cap	1 x 1000	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated Cool, 4 C	7 days
EPA 524.2*	G, VOA TFE-septa cap	2 x 40	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated or HCl pH < 2; Cool, 4 C	14 days
EPA 525**	G, amber TFE-lined cap	1 x 1000	Cool, 4 C	7 days
EPA 531	G, amber	1 x 250	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated Monochloroacetic acid buffer	14 days
EPA 547	G, amber	1 x 125	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated Cool, 4 C	6 mo.
EPA 548	G, amber	1 x 125	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated Cool, 4 C	7 days
EPA 549	G, amber silanized	1 x 1000	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated Cool, 4 C	7 days
EPA 550.1	G, amber	1 x 1000	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated Cool, 4 C	7 days
EPA 552	G, amber	1 x 1000	NH <sub>4</sub> Cl, if chlorinated Cool, 4 C	7 days
EPA 1613A	G, amber	1 x 1000	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated Cool, 4 C	7 days

\* No head space over sample.

\*\* This is the maximum holding time prior to extraction. The extracted sample may be held up to 40 days before analysis.

## Sampling Procedures

TABLE 6-1 RECOMMENDED SAMPLE COLLECTION AND PRESERVATION

<u>Analysis</u>	<u>Container</u>	<u>Volume (mL)</u>	<u>Preservation</u>	<u>Holding Time</u>
<b>Organic Chemicals</b>				
<b><u>Wastewater and Hazardous Waste</u></b>				
EPA 601/8010*	G, VOA TFE-septa cap	2 x 40	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated HCl, pH < 2; Cool, 4 C	14 days
EPA 8011	G, VOA TFE-septa cap	2 x 40	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated Cool, 4 C	28 days
EPA 602/8020*	G, VOA TFE-septa cap	2 x 40	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated HCl, pH < 2; Cool, 4 C	14 days
EPA 603/8030*	G, VOA TFE-septa cap	2 x 40	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated Adjust pH to 4-5; Cool, 4 C	14 days
EPA 604/8040**	G, amber TFE-lined cap	1 x 1000	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated Cool, 4 C	7 days
EPA 608/8080**	G, amber TFE-lined cap	1 x 1000	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated Cool, 4 C	7 days
EPA 610/8310	G, amber TFE-lined cap	1 x 1000	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated Cool, 4 C	14 days
EPA 613**	G, amber TFE-lined cap	1 x 1000	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated Cool, 4 C	7 days
EPA 614/8140**	G, amber TFE-lined cap	1 x 1000	Cool, 4 C	7 days
EPA 615/8150**	G, amber TFE-lined cap	1 x 1000	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated Cool, 4 C	7 days
EPA 619	G, amber TFE-lined cap	1 x 1000	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated Cool, 4 C	14 days

\* No head space over sample.

\*\* This is the maximum holding time prior to extraction. The extracted sample may be held up to 40 days before analysis.

\*\*\* RCRA holding time is 7 days.

Note: All solid samples should be collected in stainless steel sleeves, brass sleeves or in glass jars all with teflon-lined caps and 4-8 oz. capacity. All solid samples should be kept cool at 4 C.

## Sampling Procedures

TABLE 6-1 RECOMMENDED SAMPLE COLLECTION AND PRESERVATION

<u>Analysis</u>	<u>Container</u>	<u>Volume (mL)</u>	<u>Preservation</u>	<u>Holding Time</u>
Organic Chemicals				
<u>Wastewater and Hazardous Waste</u>				
EPA 624/8240*	G, VOA TFE-septa cap	2 x 40	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated HCl, pH < 2; Cool, 4 C	14 days
EPA 625/8270**	G, amber TFE-lined cap	1 x 1000	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated Cool, 4 C	7 days
EPA 632**	G, amber TFE-lined cap	1 x 1000	Cool, 4 C	7 days
EPA 9020* (TOX)***	G, amber TFE-lined cap	1 x 250	H <sub>2</sub> SO <sub>4</sub> , pH < 2 Cool, 4 C	14 days 7 days
EPA 415.1 (TOC)	G, amber TFE-lined cap	1 x 250	HCl or H <sub>2</sub> SO <sub>4</sub> , pH < 2 Cool, 4 C	28 days
EPA 9060	See note	250 g	Cool, 4 C	N/A
Underground Storage Tank Analyses				
EPA 418.1	G, amber TFE-lined cap	1 x 1000	Cool, 4 C	28 days
EPA 8015,8015M*	G, VOA TFE-septa cap	2 x 40	HCl, pH < 2 Cool, 4 C	14 days
EPA 601/8010*	G, VOA TFE-septa cap	2 x 40	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated HCl, pH < 2; Cool, 4 C	14 days
EPA 602/8020*	G, VOA TFE-septa cap	2 x 40	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> , if chlorinated HCl, pH < 2; Cool, 4 C	14 days

Note: All solid samples should be collected in stainless steel sleeves, brass sleeves or in glass jars all with teflon-lined caps and 4-8 oz. capacity. All solid samples should be kept cool at 4 C.

## Sampling Procedures

TABLE 6-1 RECOMMENDED SAMPLE COLLECTION AND PRESERVATION

<u>Analysis</u>	<u>Container</u>	<u>Volume (mL)</u>	<u>Preservation</u>	<u>Holding Time</u>
<b>Hazardous Waste Characterization</b>				
Corrosivity	P,G	100	Cool, 4 C	7 days
Ignitability	G TFE-lined cap	100	Cool, 4 C	7 days
Reactivity/ Reactions	G TFE-lined cap	100	Cool, 4 C	7 days
Sulfide/Sulfide generation	G TFE-lined cap	100	Cool, 4 C	7 days
<b>TTLC, STLC, TCLP, and EP Toxicity</b>				
Metals	G TFE-lined cap	500	Cool, 4 C	30 days
Pesticides	G, amber TFE-lined cap	1000	Cool, 4 C	7 days*
Herbicides	G, amber TFE-lined cap	1000	Cool, 4 C	7 days*
<b>Bioassays</b>				
Chronic	P,G	3x1000	Cool, 4 C	24 hr.
Acute	P,G	2x5 gal	Cool, 4 C	24 hr.

**Note:** All solid samples should be collected in stainless steel sleeves, brass sleeves or in glass jars all with teflon-lined caps and 4-8 oz. capacity. All solid samples should be kept cool at 4 C.

## **Sample Custody**

### **7.1 Sample Custody**

It is essential to ensure sample integrity from the time of collection through analysis and final disposition. This includes the ability to trace possession and handling of the samples. This is referred to as chain-of-custody and is important in the event of litigation involving the results. Where litigation is not involved, chain-of-custody procedures are useful for routine control of sample flow.

A sample is considered to be under a person's custody if it is in the individual's physical possession, in the individual's sight, secured in a tamper-proof manner by that individual, or is secured in an area restricted to authorized personnel. The following procedures summarize the major aspects of chain-of-custody.

#### **7.1.1 Sample Labels**

Use labels to prevent sample misidentification. Gummed paper labels or tags generally are adequate. Include at least the following information: sample number, name of collector, date and time of collection, and place of collection. Affix labels to sample containers before or at the time of sampling. Fill label out with waterproof ink at time of collection.

#### **7.1.2 Custody Seals**

Use sample seals to detect unauthorized tampering with samples up to the time of analysis. Plastic seals are normally used. Attach seal in such a way that it is necessary to break the seal to open the sample container. Affix seal to container before sample leaves custody of sampling personnel.

#### **7.1.3 Field Log Book**

Record all information pertinent to a field survey or sampling in a bound log book. As a minimum, include the following in the log book; purpose of sampling; location of sampling point; name and address of field contact; producer of material being sampled and address, if different from location; and type of sample. Because sampling situations vary widely, no general rule can be given as to the information to be entered in the log book. It is desirable to record sufficient information between the logbook and chain-of-custody so that one could reconstruct the sampling without reliance on the collector's memory. Protect the log book and keep it in a safe place.

#### **7.1.5 Shipping Samples or Sample Delivery to Laboratory**

Prior to shipping samples all documentation must be ready for proper chain of custody. The information necessary for documenting chain of custody is outlined section 7.3. After filling out the proper sample documentation, the samples and documents should be placed in an ice chest with adequate protection. Normally "Blue Ice" is used for keeping samples cool. However, dry ice may be used if approved by Department of Transportation (DOT).

If client provides direct delivery of sample to laboratory, samples should be delivered as soon as practicable. Documentation must be ready for proper chain of custody. Again, all information necessary for documenting chain of custody is outlined section 7.3. Accompany sample with chain- of-custody record and a sample analysis request sheet. Deliver sample to sample custodian.

## **Sample Custody**

### **7.1.6 Receipt and Logging of Sample**

In the laboratory, the sample custodian receives the sample and inspects its condition and seal, reconciles label information and seal against the chain-of-custody record, assigns a laboratory number, logs sample in the laboratory computer, and stores it in a secured storage room or cabinet until it is assigned to an analyst.

### **7.1.7 Assignment of Sample for Analysis**

The laboratory supervisor usually assigns the sample for analysis. Once in the laboratory, the supervisor or analyst is responsible for the sample's care and custody.

### **7.1.8 Safety Considerations**

Because sample constituents can be toxic, take adequate precautions during sampling and sample handling. Toxic substances can enter through the skin and, in the case of vapors, through the lungs. Inadvertent ingestion can occur via direct contact with foods or by adsorption of vapors onto foods. Precautions may be limited to wearing gloves or may include coveralls, aprons, or other protective apparel. Always wear eye protection. When toxic vapors might be present, sample only in well-ventilated areas or use a respirator or self-contained breathing apparatus. In a laboratory, open sample containers in a fume hood. Never have food near samples or sampling locations; always wash hands thoroughly before handling food.

If there is any possibility that flammable organic compounds may be present, take adequate precautions. Prohibit smoking near samples, sampling locations, and in the laboratory. Keep sparks, flames, and excessive heat sources away from samples, and sampling locations.

Radioactivity is screened at the time of sample receipt. Consult the radiation safety SOP and Radiation Safety Officer for proper handling of samples.

## **7.2 Laboratory Sample Control and Tracking**

FGL's sample control objectives are achieved through the use of a Laboratory Information Management System (LIMS). LIMS is a computer software system specifically designed by FGL for tracking and handling of the large amount of information required to efficiently manage an analytical chemistry laboratory. The system provides a versatile, easy-to-use vehicle for the laboratory managers and chemists to perform sample tracking and status checks.

## **7.3 Sample Receiving Policy**

Obtain a chain-of-custody record accompanying each sample or group of samples. The chain-of-custody is usually prepared in the field.



## **Sample Custody**

### **7.3.1 Obtain the following client information and record on chain of custody:**

#### **Reporting -**

Address  
Phone Number  
Fax Number  
Person to Contact

#### **Billing -**

Address  
Phone Number  
Fax Number  
P.O. or contract Number  
Person to Contact

### **7.3.2 Obtain the following project and sample information and record on chain of custody:**

Project description  
Sample descriptions  
Sample type  
Sampling date and time  
Sample containers, preservatives  
EPA Method Numbers or method descriptions  
Report form required: \_\_\_\_ State \_\_\_\_ FGL  
Determine turn-around-time requirement:  
Rush \_\_\_\_\_ Number of Days \_\_\_\_\_

### **7.3.3 Inspect the sample for the following:**

Have holding times been observed and determine if it is possible for FGL to meet holding times?  
Has the correct preservative been used?  
Is the sample size adequate?  
Is the sample container satisfactory?  
Note sample condition :  
Broken/leaking container  
Temperature \_\_\_\_\_ Ambient \_\_\_\_\_ Chilled  
Record Actual Temperature  
Check for headspace when appropriate

Also note on the chain of custody any problems with sample condition, the person notified, time and date notified, and customers response, if any.

Screen all samples for radio chemical hazard using the Geiger counter kept in the sample receiving area. Consult the radiation safety SOP and Radiation Safety Officer for proper handling of samples.

### **7.3.4 Log the sample information into the LIMS under one of the following divisions:**

Inorganic  
Organic  
Radioactivity  
Bacteriology  
Agriculture

## **Sample Custody**

**7.3.5 Transfer samples and analyses worksheets to the proper refrigerator or lab work distribution area.**

### **7.4 Sample Storage**

All samples are retained for a minimum of 30 days except for microbiological samples which are held for a shorter time. A longer storage period can be arranged at the request of the client.

### **7.5 Sample Disposal**

All samples which are considered to be potentially hazardous based upon analytical results or matrix, will be disposed of by lab packing. Extremely hazardous samples may be returned to the client for disposal. All disposal arrangements should be made with a project manager.

### **7.6 Subcontracted Lab Work**

On occasion, laboratory work may need to be subcontracted to certified labs approved by FGL Environmental. Prior to subcontracting the client will be notified. Under no circumstances will work be subcontracted without client requirements being met. When work is subcontracted, it is done so under chain of custody, and the proper records are included with the data package.

## **Sample Custody**

### **Figure 7-1 Chain of Custody**

**This page intentionally left blank for figure on next page.**



**Corporate Offices & Laboratory**  
 P.O. Box 272 / 853 Corporation Street  
 Santa Paula, CA 93061-0272

**Field Office**  
**Visalla, California**  
**TEL: (209) 734-9473**



## Calibration Procedures and Frequency

The production of analytical data of known, defensible and documented quality requires adherence to standardized procedures which cover all aspects of laboratory operation. The following sections provide details of the standardized procedures relating to instrumentation calibration.

### 8.1 Instrument Calibration

Prior to use, every instrument must be calibrated according to the procedure found in the method specific Standard Operating Procedure (SOP). A list of all laboratory equipment may be found in section 17. Tables 8-1 and 8-2 list the organic mass spectrometer calibration ion abundance criteria which must be met.

The analytical balances are certified once a year by a certified specialist. All balances are labelled as certified. All balances are checked monthly using NIST traceable S weights.

All refrigerator, oven, and incubator temperatures are monitored daily, and all thermometers are checked for accuracy on a quarterly basis.

### 8.2 Calibration Standards

All chemicals used by FGL Environmental are ACS reagent grade, or better. Wherever possible, standards are from sources that are traceable to the National Institute of Standards and Technology. A log book is maintained for all working standards. Each log contains the standard ID or code, date of working standard preparation, analyst initials who prepared the standard, the manufacturers lot number, stock solution expiration date, stock analyte concentration(s), analyte concentration(s), and initial and final volumes used in dilutions. The working standard container is also labeled with ID or code, date of standard preparation, analyst initials who prepared the standard, expiration date, analytes and analyte concentration.

### 8.3 Calibration Policy

#### 8.3.1 Applicability

This policy is designed to be a guideline to ensure that all data are treated alike, and thus ensuring that data generated on any particular day of analysis are representative of the norm. However, the policies are not intended to be absolute criteria for the acceptance or rejection of any analytical data.

In cases where the acceptance criteria outlined in policy or SOPs cannot be achieved then the analyst uses a non-conformance report form to document the difficulty. More than one continuing difficulty will result in a Corrective Action Report (CAR, see section 15). These are on record and will be included in a project data package if that is required by the project plan. An example of a CAR form is shown in figure 15-1.

#### 8.3.2 Linearity

All calibrations should be linear unless otherwise defined in the specific SOP. FGL's definition of linearity is a calibration curve that has a linear regression equal to or greater than 0.995. For organics, if a linear regression is used, a single average response factor may be used if acceptance criteria pass. Specific protocols outlined in a given SOP will take precedence over these generic policies.

## Calibration Procedures and Frequency

### 8.3.3 Selection of Quantitation Technique (Organics)

For organic analysis, a decision must be made during the validation process (and detailed in the SOP) as to whether an internal or external quantitation technique will be routinely employed.

The internal standard method of quantitation cannot be employed unless all of the following conditions are met:

- (1) The internal standard must be added post-extraction.
- (2) The internal standard must be added quantitatively.
- (3) Any analyte that is a target analyte in the method of interest may not be selected for use as an internal standard.
- (4) The concentration of the internal standard(s) must not exceed the calibration range of the method target analyte. In cases where the target analytes are associated with more than one calibration range (i.e. analytes "1-4" are calibrated from 1 to 10 ppb, while analyte "5" is calibrated from 10 to 100 ppb, all target analytes should be prepared at a level between the highest and lowest calibration standard (e.g. approximately 50 ppb in the example given).

The use of internal standard quantitation is of greatest benefit in those methods subject to injection variability, and thus, variability in the absolute mass injected onto the column(s) employed. The drawback to this technique, for GC methods, is that any compound which exhibits a similar retention time as the compound used for the internal standard will be identified as the internal standard, leading to erroneous quantitation. For this reason, the internal standard technique is most useful for GC/MS where deuterated analytes not naturally occurring can be detected and quantified.

### 8.3.4 Selection of Calibration Method

As part of the validation process, the specific calibration range and calibration method must be determined and documented in the SOP. Once determined in this manner, the same protocols must be followed each time the method is employed. This will ensure that data reduction is not performed differently on separate data sets by different analysts. The calibration acceptance criteria are listed in section 8.3.8. A least squares (linear) regression is initially tried as a calibration method. For organics, if a linear regression is used, a single average response factor may be used. For inorganics, if the acceptance criteria cannot be met using a linear regression, then a second order polynomial can be used to fit the data, with the same acceptance criteria being applied. In the event that neither a simple linear regression nor a second order polynomial fit result in an equation which meets the calibration acceptance criteria, then the calibration range must be reduced.

### 8.3.5 Minimum Number of Calibration Levels

Most calibrations include a minimum of three or five initial calibration standards plus a blank. Specific SOPs may have other requirements.



## **Calibration Procedures and Frequency**

### **8.3.6 Selection of Calibration Levels**

Two standards should be included per order of magnitude of concentration of the calibration curve. For example 0.1, 1.0, 10.0 has 2 standards per order magnitude (0.1 and 1.0; 1.0 and 10.0). In cases where instrumentation spans several orders of magnitude, the SOP for that method may not require this policy.

The lowest calibration level should be within a factor of 10 of the detection limit for reporting (DLR) for each target compound unless otherwise specified in the SOP.

### **8.3.7 Calibration Analysis Sequence**

The calibration must progress from the analysis of the lowest to highest standard unless the instrumentation does not permit it. A blank must be analyzed after the highest calibration standard.

If the analysis requires an initial high standard to set the gain, a blank must be run before starting with the low calibration standard unless the instrumentation does not permit it.

### **8.3.8 Calibration Acceptance Criteria**

In general, for inorganics, the calculated value for standards must be within 10% of the expected value. However, the value determined by the calibration curve for the lowest standard must be within  $\pm 50\%$  of the true value and if the calibration is linear through the origin (at less than  $\pm 1/2$  the detection limit). For organics, if a linear regression is used, a single average response factor may be used. The percent relative standard deviation for the individual standard response factors must be less than the maximum value listed for the method in the SOP.

### **8.3.9 Calibration Check Compounds (CCC) and Initial Calibration Verifications (ICV's)**

The CCC or ICV is used to check the validity of the initial calibration. This standard is composed of some or all of the same analytes used for calibration but from a different source than the calibration standard. The standard should be at a concentration near the midpoint of the curve. In many cases FGL uses a Laboratory Control Sample (LCS) as an ICV. In this case the LCS verifies both the calibration and sample preparation. FGL uses control charts for LCS's and acceptance ranges for many analytes have been statistically derived. Please see table 5-1 for acceptance limits. If calculated acceptance criteria are not listed, the general acceptance range is  $\pm 25\%$  of the true value for organics and  $\pm 10\%$  for inorganics.

### **8.3.10 Continuing Calibration Verifications (CCV)**

The CCV is used to verify continuing calibration validity without having to completely restandardize the instrument. Refer to specific EPA methods or SOPs to determine whether this is required. The continuing calibration standard should be near the mid-point of the calibration curve. If calculated acceptance criteria are not listed, the general acceptance range is  $\pm 25\%$  of the true value for organics and  $\pm 10\%$  for inorganics.

## Calibration Procedures and Frequency

### 8.3.11 Organic Mass Spectrometry Tuning Criteria

In addition to the above calibration criteria, GC/MS methods require mass spectrometer tuning. The acceptance criteria for volatile organics using bromofluorobenzene (BFB) are listed in table 8-1. The acceptance criteria for semivolatile organics using decafluorotriphenylphosphene (DFTPP) are listed in table 8-2.

Table 8-1

GC/MS Volatile Organic Key Ion Abundance Tuning Criteria, using BFB

<u>Mass</u>	<u>Ion Abundance Criteria</u>
50	15 to 40% of mass 95
75	30 to 60% of mass 95
95	base peak, 100% relative abundance
96	5 to 9% of mass 95
173	less than 2% of mass 174
174	greater than 50% of mass 95
175	5 to 9% of mass 174
176	greater than 95% but less than 101% of mass 174
177	5 to 9% of mass 176

Table 8-2

GC/MS Semivolatile Organic Key Ion Abundance Tuning Criteria, using DFTPP

<u>Mass</u>	<u>Ion Abundance Criteria</u>
51	30 to 60% of mass 198
68	less than 2% of mass 69
70	less than 2% of mass 69
127	40 to 60% of mass 198
197	less than 1% of mass 198
198	base peak, 100% relative abundance
199	5 to 9% of mass 198
275	10 to 30% of mass 198
365	greater than 1% of mass 198
441	present but less than mass 443
442	greater than 40% of mass 198
443	17 to 23% of mass 442

## **Calibration Procedures and Frequency**

### **8.3.12 Calibration Frequency**

#### **Inorganics**

For trace metals analyses calibrations are performed initially for each analytical run. Recalibration or continuing calibration checks are used every ten analyses. For wet chem analyses, a new curve is generated every six months. To verify daily calibration, continuing calibration verifications are used. Exceptions may exist for method specific SOPs.

#### **Organics**

GC and GC/MS methods are calibrated initially for all analytes. For each additional day of operation, a calibration check standard is analyzed and evaluated. If the calibration is deemed valid the analysis may be performed. Otherwise, the system is recalibrated. Exceptions may exist for method specific SOPs.



## **Analytical Procedures**

### **9.1 Method Sources**

FGL uses EPA or standard methods for virtually all analyses. The following method manuals are used as references:

#### **Drinking Water Methods -**

- 1) "Methods for Chemical Analysis in Waters and Waste" (MCAWW)  
EPA-600/4-79-020
- 2) "Standard Methods for the Analysis of Water and Wastewater", 17th Edition, 1990.
- 3) "Methods for the Determination of Organic Compounds in Drinking Water", EPA Method Book, EPA-600/4-88-039, December 1988.
- 4) "Methods for the Determination of Organic Compounds in Drinking Water-Supplement I", EPA Method Book, EPA-600/4-90-020, July 1990.
- 5) "Methods for the Determination of Organic Compounds in Drinking Water-Supplement II", EPA Method Book, EPA-600/4-90-020, July 1990.
- 6) "Eastern Environmental Radiation Facility Radiochemistry Procedures Manual", EPA Method Book, EPA 520/5-84-006, August 1984.
- 7) "Environmental Measurements Laboratory Procedures", HASL-300, 27th Edition, February 1992.

#### **Wastewater Methods -**

- 1) "Methods for Chemical Analysis in Waters and Waste" (MCAWW)  
EPA-600/4-79-020
- 2) "Standard Methods for the Analysis of Water and Wastewater", 17th Edition, 1990.
- 3) "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater", EPA Method Book, EPA 600/4-82-057, July 1982.
- 4) "Eastern Environmental Radiation Facility Radiochemistry Procedures Manual", EPA Method Book, EPA 520/5-84-006, August 1984.
- 5) "Environmental Measurements Laboratory Procedures", HASL-300, 27th Edition, February 1992.

#### **Solid Waste / Hazardous Waste Methods -**

- 1) "Methods for Evaluating Solid Waste", EPA Method Book, SW-846, revision 3, and proposed revisions.
- 2) "Eastern Environmental Radiation Facility Radiochemistry Procedures Manual", EPA Method Book, EPA 520/5-84-006, August 1984.
- 3) "Environmental Measurements Laboratory Procedures", HASL-300, 27th Edition, February 1992.

## **Analytical Procedures**

### **9.2 Standard Operating Procedures (SOPs)**

FGL has specific standard operating procedures (SOPs) for each analytical test we perform. These procedures contain the following major sections:

- 1) Title
- 2) Scope and Application
- 3) Summary of Method
- 4) Interferences
- 5) Safety
- 6) Sample Preparation
- 7) Reagent Preparation
- 8) Standard Preparation
- 9) Analytical Procedure
- 10) Calculations
- 11) Quality Control
- 12) Data Validation and Reporting
- 13) Record Keeping and Record Storage
- 14) Disposal of Waste
- 15) References

### **9.3 Specific Methods Used for Analysis**

The analytical methods performed at FGL fall into three general categories: drinking waters, wastewaters, and solid waste / hazardous waste methods. These methods are listed in Table 9-1.

## Analytical Procedures

TABLE 9-1 Specific Analytical Drinking Water Methods

Parameter	Method	Description
<b>Organic Chemicals</b>		
Trihalomethanes	EPA 501.2	GC/ECD, micro extraction
Volatile Organics	EPA 502.2	GC/PID/Hall, purge & trap
Dibromochloropropane (DBCP) and Ethylene dibromide (EDB)	EPA 504	GC/ECD, micro extraction
Chlorinated Pesticides	EPA 505	GC/ECD, micro extraction
Nitrogen/phosphorus Pesticides	EPA 507	GC/NPD, liquid-liquid
Chlorothalonil	EPA 508	GC/ECD, liquid-liquid
PCB's as Decachlorobiphenyl	EPA 508A	GC/ECD, liquid-liquid
Trihalomethane Form. Potential	EPA 510	GC/ECD, micro extraction
Herbicides	EPA 515.1	GC/ECD, liquid-liquid
Volatile Organics	EPA 524.2	GC/MS, purge & trap
Diethylhexylphthalate	EPA 525	GC/MS, SPE
Carbamates	EPA 531	HPLC, post column derivatization
Glyphosate (Roundup)	EPA 547	HPLC, post column derivatization
Endothall	EPA 548	HPLC, post column derivatization
Paraquat and Diquat	EPA 549	HPLC, post column derivatization
Polynuclear Aromatic Hydrocarbons	EPA 550.1	HPLC, post column derivatization
Haloacetic Acids	EPA 552.1	HPLC, post column derivatization, SPE
<b>General Inorganic Analyses</b>		
Acidity	EPA 305.1	Titration
Aggressive Index	N/A	Calculation
Alkalinity (CaCO <sub>3</sub> )	EPA 310.1	Titration
Bicarbonate (HCO <sub>3</sub> )	EPA 310.1	Titration
Biochemical Oxygen Demand (BOD <sub>5</sub> )	EPA 405.1	ISE
Bromide (Br)	EPA 300.0	IC
Carbon Dioxide (CO <sub>2</sub> )	SM 4500CO <sub>2</sub>	Titration
Carbonate (CO <sub>3</sub> )	EPA 310.1	Titration
Chemical Oxygen Demand (COD)	EPA 410.2	Colorimetric
Chloride (Cl)	EPA 300.0	IC
Chlorine Residual (Cl <sub>2</sub> )	EPA 330.4	Titration
Chlorine Residual (Cl <sub>2</sub> )	EPA 330.5	Colorimetric
Chlorine Demand	SM 409A	Titration
Color	EPA 110.3	Observation
Cyanide, Total (CN)	EPA 335.2	Colorimetric
Electrical Conductivity (EC)	EPA 120.1	Conductivity Bridge
Fluoride (F)	EPA 340.2	ISE
Hardness, total (as CaCO <sub>3</sub> )	SM 2340B	Calculation
Hydroxide (OH)	EPA 310.1	Titration
Langelier Index (corrosivity)	SM 2330B	Calculation
MBAS	EPA 425.1	Colorimetric

## Analytical Procedures

TABLE 9-1 Specific Analytical Drinking Water Methods

Parameter	Method	Description
<b>General Inorganic Analyses continued</b>		
<b>Nitrogen</b>		
Ammonia (NH <sub>3</sub> -N)	EPA 350.1	Colorimetric
Nitrate (NO <sub>3</sub> -N)	EPA 300.0	IC
Nitrite (NO <sub>2</sub> -N)	EPA 300.0	IC
Nitrate (NO <sub>3</sub> -N)	EPA 353.2	Colorimetric
Nitrite (NO <sub>2</sub> -N)	EPA 353.2	Colorimetric
Organic (TKN-NH <sub>3</sub> -N)	N/A	Calculation
Total (TKN+NO <sub>3</sub> -N+NO <sub>2</sub> -N)	N/A	Calculation
Total Kjeldahl	EPA 351.2	Colorimetric
Odor	EPA 140.1	Observation
Oil and Grease	EPA 413.1	Gravimetric
Oxygen, Dissolved (DO)	EPA 360.1	ISE
pH	EPA 150.1	ISE
Phenols	EPA 420.1	Colorimetric
<b>Phosphorous</b>		
Phosphate (PO <sub>4</sub> -P)	EPA 300.0	IC
Phosphate-dissolved (PO <sub>4</sub> -P)	EPA 300.0	IC
Total (P)	EPA 365.4	Colorimetric
Total-dissolved (P)	EPA 365.4	Colorimetric
Resistivity	N/A	Calculation
Sodium Percent	N/A	Calculation
Sodium Absorption Ratio (SAR)	EPA 200.7	ICP
<b>Solids/Residue</b>		
Filterable (TDS)	EPA 160.1	Gravimetric
Non-filterable (TSS)	EPA 160.2	Gravimetric
Total	EPA 160.3	Gravimetric
Volatile	EPA 160.4	Gravimetric
Settleable	EPA 160.5	Gravimetric
Sulfate (SO <sub>4</sub> )	EPA 300.0	IC
Sulfide (H <sub>2</sub> S)		
Total	EPA 376.2	Methylene Blue
Dissolved	EPA 376.2	Methylene Blue
Sulfite (SO <sub>2</sub> )	EPA 377.1	Titrimetric
Tannin & Lignin	SM 5500B	Colorimetric
Titration - pH adjustment	N/A	Titration
Turbidity	EPA 180.1	Nephelometric
<b>Trace Metals Analyses</b>		
Aluminum (Al)	EPA 200.9	Furnace Atomic Absorption
Aluminum (Al)	EPA 200.8	ICP/MS
Antimony (Sb)	EPA 200.9	Furnace Atomic Absorption
Antimony (Sb)	EPA 200.8	ICP/MS
Arsenic (As)	EPA 200.9	Furnace Atomic Absorption
Arsenic (As)	EPA 200.8	ICP/MS
Barium (Ba)	EPA 200.7	ICP
Barium (Ba)	EPA 200.8	ICP/MS
Beryllium (Be)	EPA 200.7	ICP



## Analytical Procedures

TABLE 9-1 Specific Analytical Drinking Water Methods

Parameter	Method	Description
<b>Trace Metals Analyses continued</b>		
Beryllium (Be)	EPA 200.8	ICP/MS
Boron (B)	EPA 200.7	ICP
Boron (B)	EPA 200.8	ICP/MS
Cadmium (Cd)	EPA 200.9	Furnace Atomic Absorption
Cadmium (Cd)	EPA 200.8	ICP/MS
Calcium (Ca)	EPA 200.7	ICP
Chromium (Cr)	EPA 200.9	Furnace Atomic Absorption
Chromium (Cr)	EPA 200.8	ICP/MS
Chromium VI (Cr+6)	EPA 7196	Colorimetric
Cobalt (Co)	EPA 200.7	ICP
Cobalt (Co)	EPA 200.8	ICP/MS
Copper (Cu)	EPA 200.7	ICP
Copper (Cu)	EPA 200.8	ICP/MS
Iron (Fe)	EPA 200.7	ICP
Lead (Pb)	EPA 200.9	Furnace Atomic Absorption
Lead (Pb)	EPA 200.8	ICP/MS
Lithium (Li)	SM 3500LiB	Flame Atomic Absorption
Magnesium (Mg)	EPA 200.7	ICP
Manganese (Mn)	EPA 200.7	ICP
Manganese (Mn)	EPA 200.8	ICP/MS
Mercury (Hg)	EPA 245.1	Cold Vapor Atomic Absorption
Mercury (Hg)	EPA 245.2	Cold Vapor Atomic Absorption
Molybdenum (Mo)	EPA 200.7	ICP
Molybdenum (Mo)	EPA 200.8	ICP/MS
Nickel (Ni)	EPA 200.7	ICP
Nickel (Ni)	EPA 200.8	ICP/MS
Potassium (K)	EPA 200.7	ICP
Selenium (Se)	EPA 200.9	Furnace Atomic Absorption
Selenium (Se)	EPA 200.8	ICP/MS
Silica (SiO <sub>2</sub> )	EPA 200.7	ICP
Silver (Ag)	EPA 200.9	Furnace Atomic Absorption
Silver (Ag)	EPA 200.8	ICP/MS
Sodium (Na)	EPA 200.7	ICP
Thallium (Tl)	EPA 200.9	Furnace Atomic Absorption
Thallium (Tl)	EPA 200.8	ICP/MS
Tin (Sn)	EPA 200.9	Furnace Atomic Absorption
Vanadium (V)	EPA 200.7	ICP
Vanadium (V)	EPA 200.8	ICP/MS
Zinc (Zn)	EPA 200.7	ICP
Zinc (Zn)	EPA 200.7	ICP/MS

## Analytical Procedures

TABLE 9-1 Specific Analytical Drinking Water Methods

Parameter	Method	Description
<b>Radiochemical Analyses</b>		
Gross Alpha	EPA 900.0	Proportional Counter
Gross Beta	EPA 900.0	Proportional Counter
Gross Alpha & Beta	EPA 900.0	Proportional Counter
Total Radium*	EPA 900.1	Isolation, Proportional Counter
Uranium	EPA 908.0	Isolation, Proportional Counter
Tritium	EPA 906.0	Distillation, Liquid Scintillation
Radon	EPA 913.0	Liquid Scintillation
<b>Bacteriological Analyses</b>		
Total & Fecal Coliform	SM9221E	Fermentation, MPN, 10 tube
Total Coliform-Colilert	SM9221D	Presence-Absence
Standard Plate Count	SM9215B	Incubation, visual count

\* Can be reported as Radium 226 if less than 3 pCi/liter.

## Analytical Procedures

TABLE 9-2 Specific Analytical Wastewater / Hazardous Waste Liquid Methods

Parameter	Method	Description
<b>Organic Chemical Analyses</b>		
Sample Preparation	EPA 3510	Liquid-Liquid extraction
Sample Preparation	EPA 3520	Continuous Liquid- Liquid
Extraction		
Sample Preparation	EPA 3580	Solvent Dilution
Purgeable Halocarbons	EPA 601/8010	GC/PID/Hall, purge & trap
EDB and DBCP	EPA 8011	GC/ECD, micro extraction
Non-Halogenated Volatile Organics	EPA 8015	GC/FID, purge & trap
Total Petroleum Hydrocarbons	EPA 8015M	GC/FID, purge & trap
Purgeable		
Non-Halogenated Volatile Organics	EPA 8015M	GC/FID, micro extraction
Extractable		
Aromatic Volatile Organics	EPA 602/8020	GC/FID, purge & trap
Phenols	EPA 604/8040	GC/ECD, liquid- liquid
Chlorinated Pesticides & PCB's	EPA 608/8080	GC/ECD, liquid- liquid
Polynuclear Aromatic Hydrocarbons	EPA 610/8310	HPLC/UV, liquid- liquid
Organophosphorus Pesticides	EPA 614/8140	GC/FPD, liquid- liquid
Chlorinated Herbicides	EPA 615/8150	GC/ECD, liquid- liquid
Volatile Organics	EPA 624/8240	GC/MS, purge & trap
Semi-volatile Organics	EPA 625/8270	GC/MS, liquid- liquid
Carbamates	EPA 632	HPLC/UV, liquid- liquid
Total Organic Carbon	(TOC)	EPA415.1/9060 IR, combustion
Total Organic Halogens (TOX)	EPA 9020	Coulometric, Pyrolysis
Total Recov. Pet. Hydrocarbons	EPA 418.1	IR, liquid-liquid
<b>General Inorganic Analyses</b>		
Acidity	EPA 305.1	Titration
Aggressive Index	N/A	Calculation
Alkalinity (CaCO <sub>3</sub> )	EPA 310.1	Titration
Bicarbonate (HCO <sub>3</sub> )	EPA 310.1	Colorimetric
Biochemical Oxygen Demand (BOD <sub>5</sub> )	EPA 405.1	ISE
Bromide (Br)	EPA 300.0	IC
Carbonate (CO <sub>3</sub> )	EPA 310.1	Titration
Carbon Dioxide (CO <sub>2</sub> )	SM 4500CO <sub>2</sub>	Titration
Chemical Oxygen Demand (COD)	EPA 410.2	Colorimetric
Chloride (Cl)	EPA 300.0	IC
Chlorine Residual (Cl <sub>2</sub> )	EPA 330.2	Titration
Chlorine Residual (Cl <sub>2</sub> )	EPA 330.5	Colorimetric
Chlorine Demand	SM 409A	Titration
Color	EPA 110.3	Visual
Cyanide, Total (CN)	EPA 335.2	Colorimetric
Electrical Conductivity (EC)	EPA 120.1	Conductivity Bridge
Fluoride (F)	EPA 340.2	ISE
Hardness, total (as CaCO <sub>3</sub> )	EPA 130.2	Titration
Hydroxide (OH)	EPA 310.1	Titration
Langelier Index (corrosivity)	SM 2330B	Calculation
MBAS	EPA 425.1	Colorimetric

## Analytical Procedures

TABLE 9-2 Specific Analytical Wastewater / Hazardous Waste Liquid Methods

Parameter	Method	Description
<b>General Inorganic Analyses continued</b>		
<b>Nitrogen</b>		
Ammonia (NH <sub>3</sub> -N)	EPA 350.1	Colorimetric
Nitrate (NO <sub>3</sub> -N)	EPA 300.0	IC
Nitrite (NO <sub>2</sub> -N)	EPA 300.0	IC
Organic (TKN-NH <sub>3</sub> -N)	Calculation	
Total (TKN+NO <sub>3</sub> -N+NO <sub>2</sub> -N)	Calculation	
Total Kjeldahl	EPA 351.2	Colorimetric
Odor	EPA 140.1	Observation
Oil and Grease	EPA 413.1	Gravimetric
Oxygen, Dissolved (DO)	EPA 360.1	ISE
pH	EPA 150.1	ISE
Phenols	EPA 420.1	Colorimetric
<b>Phosphorous</b>		
Phosphate (PO <sub>4</sub> -P)	EPA 300.0	IC
Phosphate-dissolved (PO <sub>4</sub> -P)	EPA 300.0	IC
Total (P)	EPA 365.4	Colorimetric
Total-dissolved (P)	EPA 365.4	Colorimetric
Resistivity	N/A	Calculation
Sodium Percent	N/A	Calculation
Sodium Absorption Ratio (SAR)	EPA 200.7	ICP
<b>Solids/Residue</b>		
Filterable (TDS)	EPA 160.1	Gravimetric
Non-filterable (TSS)	EPA 160.2	Gravimetric
Total	EPA 160.3	Gravimetric
Volatile	EPA 160.4	Gravimetric
Settleable	EPA 160.5	Gravimetric
Sulfate (SO <sub>4</sub> )	EPA 300.0	IC
Sulfide (H <sub>2</sub> S)		
Total	EPA 376.2	Methylene Blue
Dissolved	EPA 376.2	Methylene Blue
Sulfite (SO <sub>2</sub> )	EPA 377.1	Titrimetric
Tannin & Lignin	SM 513	Colorimetric
Titration - pH adjustment	N/A	Titration
Turbidity	EPA 180.1	Nephelometric
<b>Trace Metals Analyses</b>		
<b>Sample Preparation</b>		
Aluminum (Al)	EPA 3015	Digestion
Aluminum (Al)	EPA 200.9	Furnace Atomic Absorption
Aluminum (Al)	EPA 200.8	ICP/MS
Antimony (Sb)	EPA 200.9	Furnace Atomic Absorption
Antimony (Sb)	EPA 200.8	ICP/MS
Arsenic (As)	EPA 200.9	Furnace Atomic Absorption
Arsenic (As)	EPA 200.8	ICP/MS
Barium (Ba)	EPA 200.7	ICP
Barium (Ba)	EPA 200.8	ICP/MS
Beryllium (Be)	EPA 200.7	ICP
Beryllium (Be)	EPA 200.8	ICP/MS

## Analytical Procedures

TABLE 9-2 Specific Analytical Wastewater / Hazardous Waste Liquid Methods

Parameter	Method	Description
Trace Metals Analyses continued		
Boron (B)	EPA 200.7	ICP
Boron (B)	EPA 200.8	ICP/MS
Cadmium (Cd)	EPA 200.9	Furnace Atomic Absorption
Cadmium (Cd)	EPA 200.8	ICP/MS
Calcium (Ca)	EPA 200.7	ICP
Chromium (Cr)	EPA 200.9	Furnace Atomic Absorption
Chromium (Cr)	EPA 200.8	ICP/MS
Chromium VI (Cr+6)	EPA 7196	Colorimetric
Cobalt (Co)	EPA 200.7	ICP
Cobalt (Co)	EPA 200.8	ICP/MS
Copper (Cu)	EPA 200.7	ICP
Copper (Cu)	EPA 200.8	ICP/MS
Gold (Au)	EPA 231.1	Flame Atomic Absorption
Iron (Fe)	EPA 200.7	ICP
Lead (Pb)	EPA 200.9	Furnace Atomic Absorption
Lead (Pb)	EPA 200.8	ICP/MS
Lithium (Li)	SM 3500LiB	Flame Atomic Absorption
Magnesium (Mg)	EPA 200.7	ICP
Manganese (Mn)	EPA 200.7	ICP
Manganese (Mn)	EPA 200.8	ICP/MS
Mercury (Hg)	EPA 245.1	Cold Vapor Atomic Absorption
Mercury (Hg)	EPA 245.2	Cold Vapor Atomic Absorption
Molybdenum (Mo)	EPA 200.7	ICP
Molybdenum (Mo)	EPA 200.8	ICP/MS
Nickel (Ni)	EPA 200.7	ICP
Nickel (Ni)	EPA 200.8	ICP/MS
Potassium (K)	EPA 200.7	ICP
Selenium (Se)	EPA 200.9	Furnace Atomic Absorption
Selenium (Se)	EPA 200.8	ICP/MS
Silica (SiO <sub>2</sub> )	EPA 200.7	ICP
Silver (Ag)	EPA 200.9	Furnace Atomic Absorption
Silver (Ag)	EPA 200.8	ICP/MS
Sodium (Na)	EPA 200.7	ICP
Strontium (Sr)	EPA 200.7	ICP
Thallium (Tl)	EPA 200.9	Furnace Atomic Absorption
Thallium (Tl)	EPA 200.8	ICP/MS
Tin (Sn)	EPA 200.9	Furnace Atomic Absorption
Titanium (Ti)	EPA 200.7	ICP
Uranium (U)	EPA 200.7	ICP
Vanadium (V)	EPA 200.7	ICP
Zinc (Zn)	EPA 200.7	ICP
Zinc (Zn)	EPA 200.7	ICP/MS

## Analytical Procedures

**TABLE 9-2 Specific Analytical Wastewater / Hazardous Waste Liquid Methods**

Parameter	Method	Description
<b>Radio Chemical Analyses</b>		
Gross Alpha	EPA 900.0	Proportional counter
Gross Beta	EPA 900.0	Proportional counter
Gross Alpha & Beta	EPA 900.0	Proportional counter
Total Radium*	EPA 900.1	Isolation, proportional counter
Uranium	EPA 908.0	Isolation, proportional counter
Tritium	EPA 906.0	Distillation, liquid scintillation
Radon	EPA 913.0	Liquid scintillation
<b>Bacteriological Analyses</b>		
Total Coliform	SM9221E	Fermentation, MPN, 15 tube
Total & Fecal Coliform	SM9221E	Fermentation, MPN, 15 tube
Standard Plate Count	SM9215B	Incubation, visual count

\* Can be reported as Radium 226 if less than 3 pCi/liter.

## Analytical Procedures

TABLE 9-3 Specific Analytical Solid Waste / Hazardous Waste Methods

Parameter	Method	Description
<b>Organic Chemical Analyses</b>		
Sample Preparation - STLC	Title 22	Extraction
Sample Preparation - EP TOX	EPA 1310	Extraction
Sample Preparation - TCLP	EPA 1311	Extraction
Sample Preparation	EPA 3510	Liquid-Liquid extraction
Sample Preparation	EPA 3520	Continuous Liquid-Liquid
Extraction		
Sample Preparation	EPA 3540	Soxhlet Extraction
Sample Preparation	EPA 3550	Sonication Extraction
Sample Preparation	EPA 3580	Solvent Dilution
Purgeable Halocarbons	EPA 8010	GC/PID/Hall, purge & trap
EDB and DBCP	EPA 8011	GC/ECD, micro extraction
Non-Halogenated Volatile Organics	EPA 8015	GC/FID, purge & trap
Total Petroleum Hydrocarbons	EPA 8015M	GC/FID, purge & trap
Purgeable		
Total Petroleum Hydrocarbons	EPA 8015M	GC/FID, micro extraction
Extractable		
Aromatic Volatile Organics	EPA 8020	GC/FID, purge & trap
Phenols	EPA 8040	GC/CED, soxhlet or sonication
Chlorinated Pesticides & PCB's	EPA 8080	GC/ECD, soxhlet or sonication
Polynuclear Aromatic Hydrocarbons	EPA 8100	GC/PID, soxhlet or sonication
Organophosphorus Pesticides	EPA 8141	GC/FPD, soxhlet or sonication
Chlorinated Phenoxy Herbicides	EPA 8150	GC/ECD, soxhlet or sonication
Volatile Organics	EPA 8240	GC/MS, purge & trap
Semi-volatile Organics	EPA 8270	GC/MS, soxhlet or sonication
Polynuclear Aromatic Hydrocarbons	EPA 8310	HPLC/UV, liquid- liquid
Carbamates	EPA 632	HPLC/UV, liquid- liquid
Total Organic Carbon (TOC)	EPA 9060	IR, combustion
Total Organic Halogens (TOX)	EPA 9020	Coulometric, Pyrolysis
Total Recov. Pet. Hydrocarbons	EPA 418.1	IR, liquid-liquid
<b>General Inorganic Analyses</b>		
Chloride (Cl)	EPA 9056	IC
Electrical Conductivity	EPA 120.1	Conductivity bridge
Cyanide, total (CN)	EPA 335.2	Distillation- Colorimetric
Fluoride (F)	EPA 340.1	Distillation-ISE
Moisture	ASA/UL	Gravimetric
<b>Nitrogen</b>		
Ammonia (NH <sub>3</sub> -N)	EPA 350.1	Colorimetric
Nitrate (NO <sub>3</sub> -N)	EPA 9056	IC
Nitrite (NO <sub>2</sub> -N)	EPA 9056	IC
Organic (TKN-NH <sub>3</sub> -N)	N/A	Calculation
Total (TKN+NO <sub>3</sub> -N+NO <sub>2</sub> -N)	N/A	Calculation
Total Kjeldahl	EPA 351.1	Colorimetric
<b>Oil and grease</b>		
Soxhlet	EPA 413.1M	Gravimetric

## Analytical Procedures

TABLE 9-3 Specific Analytical Solid Waste / Hazardous Waste Methods

Parameter	Method	Description
<b>General Inorganic Analyses continued</b>		
pH	EPA 9045	ISE
Phosphorous		
Phosphate (PO <sub>4</sub> )	EPA 9056	IC
Total (P)	See Trace Metals	
Sulfate (SO <sub>4</sub> )	EPA 9056	IC
Sulfide (H <sub>2</sub> S)	EPA 376.2	Colorimetric
<b>Hazardous Waste Characterization Analyses</b>		
Corrosivity (pH)		
Aqueous sample	EPA 9040	ISE
Nonaqueous sample	EPA 9045	ISE
Ignitability		
Aqueous (Flashpoint)	EPA 1010	Flashpoint
Nonaqueous (Flammability)	EPA 1020	Flashpoint
Reactivity	SW-846 Ch 8	Observations
Reaction with water		
Reaction with dilute acid		
Reaction with dilute base		
Reaction with oxidizing agent		
Reaction with reducing agent		
Generation	SW-846 Ch 7	Screens
Sulfide		
Cyanide		
<b>Trace Metals</b>		
Sample Preparation - TTLC	EPA 3050	Digestion
Sample Preparation - STLC	Title 22	Extraction
Sample Preparation - EP TOX	EPA 1310	Extraction
Sample Preparation - TCLP	EPA 1311	Extraction
Aluminum (Al)	EPA 6010	ICP
Aluminum (Al)	EPA 6020	ICP/MS
Antimony (Sb)	EPA 7041	Furnace Atomic Absorption
Antimony (Sb)	EPA 6020	ICP/MS
Arsenic (As)	EPA 7060	Furnace Atomic Absorption
Arsenic (As)	EPA 6020	ICP/MS
Barium (Ba)	EPA 6010	ICP
Barium (Ba)	EPA 6020	ICP/MS
Beryllium (Be)	EPA 6010	ICP
Beryllium (Be)	EPA 6020	ICP/MS
Boron (B)	EPA 6010	ICP
Boron (B)	EPA 6020	ICP/MS
Cadmium (Cd)	EPA 6010	ICP
Cadmium (Cd)	EPA 6020	ICP/MS
Calcium (Ca)	EPA 6010	ICP
Chromium (Cr)	EPA 6010	ICP
Chromium (Cr)	EPA 6010	ICP/MS
Chromium VI (Cr+6)	EPA 7196	Colorimetric



## Analytical Procedures

TABLE 9-3 Specific Analytical Solid Waste / Hazardous Waste Methods

Parameter	Method	Description
<b>Trace Metals Analyses continued</b>		
Cobalt (Co)	EPA 6010	ICP
Cobalt (Co)	EPA 6020	ICP/MS
Copper (Cu)	EPA 6010	ICP
Copper (Cu)	EPA 6020	ICP/MS
Gold (Au)	EPA 231.1	Flame Atomic Absorption
Iron (Fe)	EPA 6010	ICP
Lead (Pb)	EPA 7420	Flame Atomic Absorption
Lead (Pb)	EPA 6020	ICP/MS
Lithium (Li)	EPA 7430	Flame Atomic Absorption
Magnesium (Mg)	EPA 6010	ICP
Manganese (Mn)	EPA 6010	ICP
Manganese (Mn)	EPA 6020	ICP/MS
Mercury (Hg)	EPA 7470	Cold Vapor Atomic Absorption
Molybdenum (Mo)	EPA 6010	ICP
Molybdenum (Mo)	EPA 6020	ICP/MS
Nickel (Ni)	EPA 6010	ICP
Nickel (Ni)	EPA 6020	ICP/MS
Phosphorous (P)	EPA 6010	ICP
Potassium (K)	EPA 6010	ICP
Selenium (Se)	EPA 7741	Furnace Atomic Absorption
Selenium (Se)	EPA 6020	ICP/MS
Silver (Ag)	EPA 6010	ICP
Silver (Ag)	EPA 6020	ICP/MS
Sodium (Na)	EPA 6010	ICP
Strontium (Sr)	EPA 6010	ICP
Thallium (Tl)	EPA 7841	Furnace Atomic Absorption
Thallium (Tl)	EPA 6020	ICP/MS
Tin (Sn)	EPA 6010	ICP
Titanium (Ti)	EPA 6010	ICP
Uranium (U)	EPA 6010	ICP
Vanadium (V)	EPA 6010	ICP
Zinc (Zn)	EPA 6010	ICP
Zinc (Zn)	EPA 6020	ICP/MS
<b>Radio Chemical Analyses</b>		
Gross Alpha	EPA 900.0	Proportional counter
Gross Beta	EPA 900.0	Proportional counter
Gross Alpha & Beta	EPA 900.0	Proportional counter
Total Radium*	EPA 900.1	Isolation, proportional counter
Uranium	EPA 908.0	Isolation, proportional counter
Tritium	EPA 906.0	Distillation, liquid scintillation
Radon	EPA 913.0	Liquid scintillation

\* Can be reported as Radium 226 if less than 3 pCi/liter.



## **Data Reduction, Validation, and Reporting**

The process of transforming raw analytical data into a finished report involves steps which are generally grouped into the categories of data reduction, data validation, and reporting. It involves mathematical modeling of the standard calibration curves, statistical analysis of the acquired data, calculations to account for preparation steps and dilutions, verification of adherence to quality assurance procedures, and the generation of hardcopy output.

### **10.1 Data Reduction**

At FGL Environmental the analyst has the primary responsibility for reducing raw data. This process consists primarily of converting raw data into final reportable values by comparing individual sample results against those obtained for calibration purposes then accounting for any dilutions or concentration.

For each method, all raw data results are recorded on method specific forms or in a standardized output from each of the various instruments. Details on procedures for data reduction may be found in the laboratory SOP for each method.

### **10.2 Data Validation**

Upon completion of each analytical run, the analyst enters or transfers the data to LIMS. The analytical raw data and LIMS generated QC summary sheets are validated by the laboratory supervisor or a backup peer analyst. They verify that all quality control parameters fall within acceptance limits and also review the analytical data for calculation errors and inconsistencies.

### **10.3 Data Review Policy**

The raw data review includes all documentation associated with the samples, including chromatograms, instrument run logs, digestion logs, and other instrument printouts. Upon approval by the analyst or supervisor, the analytical results for the run are transferred to a results database for compiling with other data for that sample. When all results for a sample have been entered, an on screen report is generated for review and validation by the supervisor. Upon approval by the supervisor sample reports are then released for final hardcopy reporting, which is forwarded to the client.

Data review includes the following:

- 1) All data packages are reviewed by a second analyst or the supervisor. The QC batch report and analytical run sheets (if applicable) must be signed by the reviewer.
- 2) All supervisors must review the data released for reporting.
- 3) Analysis reports are printed and again reviewed by the supervisor and lab director and signed by each upon approval.
- 4) Quality Control reports are printed and are reviewed and signed by the quality assurance director or officer.

## **Data Reduction, Validation and Reporting**

### **10.4 Data Reporting**

Having received approval, the hardcopy report is then generated. Quality assurance reports are also generated at this step. Again, the final reports are reviewed before signing by both the department supervisor and laboratory director. Invoices are also reviewed and initialed by the department supervisor.

### **10.5 Data Storage**

FGL Environmental maintains report files and the supporting raw data for the current and previous year on the premises. Reports and raw data are maintained for a total of ten years in the secured data storage facility.

## Internal Quality Control

An internal quality control program requires a set of routine internal procedures for assuring that the data generated from a measurement system meets prescribed criteria for data quality. An effective internal QC program must be capable of measuring and controlling the quality of the data, in terms of precision, accuracy, and completeness (see sections 5 and 14 for these details).

This section identifies QC protocols associated with analytical procedures. Table 11-1 is a general outline of quality control parameters monitored for each procedure. Included are general quality control measures as well as specific quality control checks which provide continual control and assessment of data quality. Figures 11-1 through 11-3 are examples of FGL Control Charts.

FGL uses continuing calibration verifications (CCV) and initial calibration verification (ICV) for instrument quality control. The laboratory control sample (LCS) is used for sample preparation quality control. The CCV standard only verifies continuing calibration. The ICV standard is used to independently verify the calibration and may take the place of CCV when used on a continuing basis during analysis. The LCS may take the place of both ICV and CCV when prepared independently and used on a continuing basis during analysis.

### 11.1 Quality Control Parameters

#### 11.1.1 Initial Demonstration of Capability

Before analyzing samples, the laboratory must prove proficiency in the method by preparing a data package for certification. The laboratory normally provides the following information:

- 1) calibration data
- 2) calibration verification from an independent source
- 3) method detection limit data
- 4) detection limit verification data
- 5) accuracy and precision data

These must all be acceptable under the method QC criteria or, when requirements are not specified, reasonably meet good laboratory practices and Department of Health Services requirements.

#### 11.1.2 Analysis Quality Controls

##### 11.1.2.1 Instrument Blank

The instrument or calibration blank is used to calibrate the instrument. This blank contains the same reagents used in the standards and samples. However, the blank is prepared under controlled conditions and is not processed like all samples.

##### 11.1.2.2 Detection Limit Standard (DLS)

Normally, method detection limits (MDLs) are performed on an annual basis. However, this doesn't adequately reflect the day-to-day variations in the analysis. FGL has taken a different approach. We perform what we call detection limit standards on a daily basis. This gives more "representative" method detection limits. Tracking the DLS using our LIMS allows us to monitor instrument and method performance. Historically, we can also prove what our MDL was at a particular time.

## **Internal Quality Control**

### **11.1.2.3 Initial Calibration Verification (ICV)**

ICV is used as an independent verification of the calibration. EPA protocol recommends analysis of ICV for each analytical calibration. ICV samples are manufacturer or laboratory prepared from independent suitable reference standards. The ICV usually contains the analytes of interest at a concentration in the mid-calibration range. Method specific acceptance criteria are used when possible. When method specific criteria are unavailable, the recoveries are control charted to obtain acceptance limits.

### **11.1.2.4 Continuing Calibration Verification (CCV)**

CCV is used to verify continuing calibration. Many EPA methods require analysis of CCV's on a per batch or per day basis. CCV samples are manufacturer or laboratory prepared from suitable reference standards. This standard may or may not be independent of the calibration stock standards. The CCV usually contains the analytes of interest at a concentration in the mid-calibration range. Method specific acceptance criteria are used when possible. When method specific criteria are unavailable the recoveries are control charted to obtain acceptance limits.

### **11.1.2.5 Internal Standards (IS)**

An IS is a synthetic compound not occurring in an environmental sample but has chemical behavior similar to that of the target analytes. EPA protocol requires IS for specific methods on a per sample basis (including QC samples). The IS serves as a check on the analysis and corrects for instrumental drift or matrix effects. Method specific acceptance criteria are used when possible. When method specific criteria are unavailable the recoveries are control charted to obtain acceptance limits.

## **11.1.3 Method Quality Controls**

### **11.1.3.1 Method Blank**

The method blank is used to ensure that any positive results were not because of reagent or labware contamination. Before analyzing any samples, the analyst must demonstrate through the analysis of a method blank, that all glassware and reagents are free of contaminants. Each time a set of samples is extracted, a method blank must be processed to check for laboratory contamination. The blank samples should be carried through all stages of the sample preparation and analysis. Lack of contamination is demonstrated if all target analytes with the exception of common laboratory reagents are below their DLRs.

### **11.1.3.2 Laboratory Control Sample (LCS)**

The LCS is used to verify overall accuracy of the method. EPA protocol requires analysis of an LCS for each analytical batch when appropriate. The LCS consists of either a control matrix spiked with analytes representative of the target analytes or a certified reference material. Whenever possible, the LCS contains the analyte of interest at a concentration in the mid-calibration range. This standard may or may not be independent of the calibration stock standards. Initially method specific acceptance criteria are used. Eventually, or when method specific criteria are unavailable, the recoveries are control charted to obtain acceptance limits.

## **Internal Quality Control**

### **11.1.3.3 Surrogate Spikes**

Surrogate spikes serve as a check on the extraction process where extraction is a necessary part of the analytical procedure. When surrogate recovery is within limits it indicates that the extraction was complete. A surrogate is a compound not expected to occur in an environmental sample but has chemical behavior similar to that of the target analytes. EPA protocol requires surrogate spikes for specific methods on a per sample basis (including QC samples). Initially method specific acceptance criteria are used. Eventually, or when method specific criteria are unavailable, the recoveries are control charted to obtain acceptance limits.

### **11.1.3.4 Matrix Spike/Matrix Spike Duplicates (MS/MSD)**

The MS/MSD is used to verify matrix specific precision and accuracy. EPA protocol normally requires analysis of MS/MSD samples for each analytical batch or matrix type. The MS/MSD spikes are manufacturer or laboratory prepared from suitable reference standards. This standard may or may not be independent of the calibration stock standards. The matrix spike recovery and relative percent difference (RPD) acceptance criteria are shown in Section 5. When matrix spike results fall outside limits published in the respective methods, The LCS is used to verify method control. If spike recoveries are outside normal limits due to matrix problems, the data should be reported noting matrix interference. The spike recovery and RPD acceptance limits are test specific and are control charted.

### **11.1.3.5 Duplicates**

Duplicates are used to verify matrix specific precision. EPA protocol normally requires analysis of duplicate samples for each analytical batch or matrix type. The relative percent difference (RPD) calculated from duplicate analyses provide an assessment of precision. The RPD acceptance limits are test specific and are control charted.

## **11.1.4 Radiochemical Specific Quality Controls**

### **11.1.4.1 Efficiency vs. Dissolved Solids Chart**

Dissolved solids mask or decrease the radiation picked up by the counting wire. For each instrument an efficiency vs. solids chart must be generated as part of the initial demonstration of capability. In addition, whenever an instrument is maintained or repaired (i.e. a counting wire replaced) a new efficiency vs. solids chart must be generated. Samples containing solids such that the efficiency of counting drops below ten percent must be reset using a smaller aliquot so that the solids give acceptable counting efficiency. Prior to setting up a sample, an electrical conductivity measurement must be made for estimation of total dissolved solids.

### **11.1.4.2 Background**

Background samples are run daily, prior to sample analysis. However, a weekly average may be used for calculation purposes.

## Internal Quality Control Checks

An internal quality control program requires a set of routine internal procedures for assuring that the data generated from a measurement system meets prescribed criteria for data quality. An effective internal QC program must be capable of measuring and controlling the quality of the data, in terms of precision, accuracy, and completeness (see sections 5 and 14 for these details).

This section identifies QC protocols associated with analytical procedures. Table 11-1 is a general outline of quality control parameters monitored for each procedure. Included are general quality control measures as well as specific quality control checks which provide continual control and assessment of data quality. Figures 11-1 through 11-3 are examples of FGL Control Charts.

FGL uses continuing calibration verifications (CCV) and initial calibration verification (ICV) for instrument quality control. The laboratory control sample (LCS) is used for sample preparation quality control. The CCV standard only verifies continuing calibration. The ICV standard is used to independently verify the calibration and may take the place of CCV when used on a continuing basis during analysis. The LCS may take the place of both ICV and CCV when prepared independently and used on a continuing basis during analysis.

### 11.1 Quality Control Parameters

#### 11.1.1 Initial Demonstration of Capability

Before analyzing samples, the laboratory must prove proficiency in the method by preparing a data package for certification. The laboratory normally provides the following information:

- 1) calibration data
- 2) calibration verification from an independent source
- 3) method detection limit data
- 4) detection limit verification data
- 5) accuracy and precision data

These must all be acceptable under the method QC criteria or, when requirements are not specified, reasonably meet good laboratory practices and Department of Health Services requirements.

#### 11.1.2 Analysis Quality Controls

##### 11.1.2.1 Instrument Blank

The instrument or calibration blank is used to calibrate the instrument. This blank contains the same reagents used in the standards and samples. However, the blank is prepared under controlled conditions and is not processed like all samples.

##### 11.1.2.2 Detection Limit Standard (DLS)

Normally, method detection limits (MDLs) are performed on an annual basis. However, this doesn't adequately reflect the day-to-day variations in the analysis. FGL has taken a different approach. We perform what we call detection limit standards on a daily basis. This gives more "representative" method detection limits. Tracking the DLS using our LIMS allows us to monitor instrument and method performance. Historically, we can also prove what our MDL was at a particular time. The standard should be 3-10 times the MDL and may or may not be prepared independently of the calibration standards.



## **Internal Quality Control Checks**

### **11.1.2.3 Initial Calibration Verification (ICV)**

ICV is used as an independent verification of the calibration. EPA protocol recommends analysis of ICV for each analytical calibration. ICV samples are manufacturer or laboratory prepared from independent suitable reference standards. The ICV usually contains the analytes of interest at a concentration in the mid-calibration range. Method specific acceptance criteria are used when possible. When method specific criteria are unavailable, the recoveries are control charted to obtain acceptance limits.

### **11.1.2.4 Continuing Calibration Verification (CCV)**

CCV is used to verify continuing calibration. Many EPA methods require analysis of CCV's on a per batch or per day basis. CCV samples are manufacturer or laboratory prepared from suitable reference standards. This standard may or may not be independent of the calibration stock standards. The CCV usually contains the analytes of interest at a concentration in the mid-calibration range. Method specific acceptance criteria are used when possible. When method specific criteria are unavailable the recoveries are control charted to obtain acceptance limits.

### **11.1.2.5 Internal Standards (IS)**

An IS is a synthetic compound not occurring in an environmental sample but has chemical behavior similar to that of the target analytes. EPA protocol requires IS for specific methods on a per sample basis (including QC samples). The IS serves as a check on the analysis and corrects for instrumental drift or matrix effects. Method specific acceptance criteria are used when possible. When method specific criteria are unavailable the recoveries are control charted to obtain acceptance limits.

## **11.1.3 Method Quality Controls**

### **11.1.3.1 Method Blank**

The method blank is used to ensure that any positive results were not because of reagent or labware contamination. Before analyzing any samples, the analyst must demonstrate through the analysis of a method blank, that all glassware and reagents are free of contaminants. Each time a set of samples is extracted, a method blank must be processed to check for laboratory contamination. The blank samples should be carried through all stages of the sample preparation and analysis. Lack of contamination is demonstrated if all target analytes with the exception of common laboratory reagents are below their DLRs.

### **11.1.3.2 Field Blank**

The field blank is used to ensure that any positive results were not because of contamination occurring during sampling. The field blank samples should be carried through all stages of the sample preparation and analysis. Lack of contamination is demonstrated if all target analytes with the exception of common laboratory reagents are below their DLRs.

## **Internal Quality Control Checks**

### **11.1.3.3 Travel Blank**

The travel blank is used to ensure that any positive results were not because of contamination occurring during shipping and handling of the samples. The travel blank samples should be carried through all stages of the sample preparation and analysis. Lack of contamination is demonstrated if all target analytes with the exception of common laboratory reagents are below their DLRs.

### **11.1.3.4 Laboratory Control Sample (LCS)**

The LCS is used to verify overall accuracy of the method. EPA protocol requires analysis of an LCS for each analytical batch when appropriate. The LCS consists of either a control matrix spiked with analytes representative of the target analytes or a certified reference material. Whenever possible, the LCS contains the analyte of interest at a concentration in the mid-calibration range. This standard may or may not be independent of the calibration stock standards. Initially method specific acceptance criteria are used. Eventually, or when method specific criteria are unavailable, the recoveries are control charted to obtain acceptance limits.

### **11.1.3.5 Surrogate Spikes**

Surrogate spikes serve as a check on the extraction process where extraction is a necessary part of the analytical procedure. When surrogate recovery is within limits it indicates that the extraction was complete. A surrogate is a compound not expected to occur in an environmental sample but has chemical behavior similar to that of the target analytes. EPA protocol requires surrogate spikes for specific methods on a per sample basis (including QC samples). Initially method specific acceptance criteria are used. Eventually, or when method specific criteria are unavailable, the recoveries are control charted to obtain acceptance limits.

### **11.1.3.6 Matrix Spike/Matrix Spike Duplicates (MS/MSD)**

The MS/MSD is used to verify matrix specific precision and accuracy. EPA protocol normally requires analysis of MS/MSD samples for each analytical batch or matrix type. The MS/MSD spikes are manufacturer or laboratory prepared from suitable reference standards. This standard may or may not be independent of the calibration stock standards. The matrix spike recovery and relative percent difference (RPD) acceptance criteria are shown in Section 5. When matrix spike results fall outside limits published in the respective methods, The LCS is used to verify method control. If spike recoveries are outside normal limits due to matrix problems, the data should be reported noting matrix interference. The spike recovery and RPD acceptance limits are test specific and are control charted.

### **11.1.3.7 Duplicates**

Duplicates are used to verify matrix specific precision. EPA protocol normally requires analysis of duplicate samples for each analytical batch or matrix type. The relative percent difference (RPD) calculated from duplicate analyses provide an assessment of precision. The RPD acceptance limits are test specific and are control charted.

## **Internal Quality Control Checks**

### **11.1.4 Radiochemical Specific Quality Controls**

#### **11.1.4.1 Efficiency vs. Dissolved Solids Chart**

Dissolved solids (TDS) mask or decrease the radiation picked up by the counting wire. For each instrument an efficiency vs. solids chart must be generated as part of the initial demonstration of capability. In addition, whenever an instrument is maintained or repaired (i.e. a counting wire replaced) a new efficiency vs. TDS chart must be generated. Samples containing solids such that the efficiency of counting drops below ten percent must be reset using a smaller aliquot so that the solids give acceptable counting efficiency. Whenever possible an electrical conductivity measurement is used to estimate TDS and sample aliquots.

#### **11.1.4.2 Background**

Background samples are run daily, prior to sample analysis. However, a weekly average may be used for calculation purposes.

Internal Quality Control

Table 11-1 Quality Controls for Drinking Water Methods

<u>TEST</u>	<u>DLS</u>	<u>INST BLANK</u>	<u>METHOD BLANK</u>	<u>CCV</u>	<u>ICV</u>	<u>LCS</u>	<u>BS/BSD</u>	<u>MS/MSD</u>	<u>DUP</u>	<u>SURR</u>	<u>I.S.</u>
<u>Semivolatile Organics</u>											
EPA 501.2	Daily	Batch	Batch			Batch		Batch			
EPA 504	Daily	Batch	Batch			Batch		Batch			
EPA 505	Daily	Batch	Batch			Batch		Batch			
EPA 507	Daily	Batch	Batch			Batch		Batch		Sample	
EPA 508	Daily	Batch	Batch			Batch		Batch		Sample	
EPA 508A	Daily	Batch	Batch			Batch		Batch			
EPA 510	Daily	Batch	Batch			Batch		Batch			
EPA 515.1	Daily	Batch	Batch			Batch		Batch		Sample	
EPA 525	Daily	Batch	Batch			Batch		Batch		Sample	Sample
EPA 531	Daily	Batch	Batch			Batch		Batch		Sample	
EPA 547	Daily	Batch	Batch			Batch		Batch			
EPA 548	Daily	Batch	Batch			Batch		Batch		Sample	
EPA 549	Daily	Batch	Batch			Batch		Batch			
EPA 550.1	Daily	Batch	Batch			Batch		Batch		Sample	
EPA 552	Daily	Batch	Batch			Batch		Batch		Sample	
TOC	Daily	Batch			Batch			Batch			
TOX	Daily	Batch			Batch			Batch			
<u>Volatile Organics</u>											
EPA 502.2	Daily	Batch			Batch			Batch		Sample	Sample
EPA 524.2	Daily	Batch			Batch			Batch		Sample	Sample
<u>Inorganic Chemicals</u>											
Alkalinity	Daily				Batch				Batch		
Ammonia	Daily	Batch			Batch			Batch			
BOD	Daily	Batch				Batch			Batch		
Carbon Dioxide									Batch		
COD	Daily	Daily				Batch		Batch			
COD, % Transmittance	Daily	Daily				Batch		Batch			
Cl Res., colorimetric	Daily	Batch			Batch				Batch		
Cl Res., titrimetric					Batch				Batch		

### Table 11-1 Quality Controls for Drinking Water Methods

<u>TEST</u>	<u>DLS</u>	<u>INST BLANK</u>	<u>METHOD BLANK</u>	<u>CCV</u>	<u>ICV</u>	<u>LCS</u>	<u>BS/BSD</u>	<u>MS/MSD</u>	<u>DUP</u>	<u>SURR</u>	<u>I.S.</u>
<u>Inorganic Chemical continued</u>											
Cyanide, Free	Daily	Batch			Batch			Batch			
Cyanide, Total	Daily	Batch	Batch	Batch			Batch	Batch			
E.C.	Daily				Batch				Batch		
Fluoride (Distillation)		Batch	Batch			Batch		Batch			
Fluoride	Daily	Batch			Batch			Batch			
Gen. Physical									Batch		
Ignitability				Batch					Batch		
Ion Chromatography	Daily	Batch			Batch			Batch			
MBAS Extraction	Daily	Batch				Batch		Batch			
MBAS Screen										Batch	
Moisture, percent										Batch	
Oxygen, Dissolved										Batch	
Nitrate - Technicon	Daily	Batch			Batch			Batch			
Nitrite - Technicon	Daily	Batch			Batch			Batch			
Oil & Grease, Pet	Daily	Batch				Batch	Batch				
Oil & Grease, Sox	Daily	Batch				Batch	Batch				
Oil & Grease	Daily	Batch				Batch	Batch				
pH					Batch				Batch		
pH, Adjustment										Batch	
Phenols	Daily	Batch	Batch			Batch		Batch			
Phosphorous, Total	Daily	Batch	Batch			Batch		Batch			
Reactivity, Generation										Batch	
Reactivity									Batch		
Solids, Fixed	Daily	Batch				Batch			Batch		
Solids, Settleable											
Solids, Total	Daily	Batch				Batch			Batch		
Solids, T. Dissolved	Daily	Batch				Batch			Batch		
Solids, T. Suspended	Daily	Batch				Batch			Batch		
Solids, Volatile	Daily	Batch							Batch		
Solids, V. Suspended	Daily	Batch							Batch		
Sulfide, Diss									Batch		

Internal Quality Control

Table 11-1 Quality Controls for Drinking Water Methods

<u>TEST</u>	<u>DLS</u>	<u>INST BLANK</u>	<u>METHOD BLANK</u>	<u>CCV</u>	<u>ICV</u>	<u>LCS</u>	<u>BS/BSD</u>	<u>MS/MSD</u>	<u>DUP</u>	<u>SURR</u>	<u>I.S.</u>
<u>Inorganic Chemical continued</u>											
Sulfide, Total									Batch		
Sulfite									Batch		
TKN	Daily	Batch				Batch		Batch			
Tannin & Lignin	Daily	Batch				Batch		Batch			
<u>Trace Metals</u>											
Cr VI	Daily	Batch			Batch			Batch			Batch
FAA	Daily	Batch				Batch		Batch			
GFAA	Daily	Batch				Batch		Batch			
ICP	Daily	Batch				Batch		Batch			
ICP/MS	Daily	Batch				Batch		Batch			Sample
Hg - CVAA	Daily	Batch				Batch		Batch			
<u>Radiochemistry</u>											
Gross A & B		Batch					Batch				
Nuclide Screen		Batch					Batch				
Radium 226 & 228		Batch					Batch				
Radon		Batch					Batch				
Strontium 90		Batch					Batch				
Tritium		Batch					Batch				
Uranium		Batch					Batch				

Internal Quality Control

Table 11-2 Quality Controls for Wastewater / Hazardous Waste Liquid Methods

<u>TEST</u>	<u>DLS</u>	<u>INST BLANK</u>	<u>METHOD BLANK</u>	<u>CCV</u>	<u>ICV</u>	<u>LCS</u>	<u>BS/BSD</u>	<u>MS/MSD</u>	<u>DUP</u>	<u>SURR</u>	<u>I.S.</u>
<u>Semivolatile Organics</u>											
EPA 3510			Batch			Batch		Batch			
EPA 3520			Batch			Batch		Batch			
EPA 3540			Batch			Batch		Batch			
EPA 3550			Batch			Batch		Batch			
EPA 3580			Batch			Batch			Batch		
TCLP			Batch						Batch		
EPA 8015	Daily	Batch			Batch						
EPA 8015M (Purgeable)	Daily	Batch			Batch						
EPA 8015M (Extract)	Daily	Batch			Batch						
EPA 604/8040	Daily	Batch			Batch						Sample
EPA 608/8080	Daily	Batch			Batch					Sample	
EPA 610/8310	Daily	Batch			Batch						
EPA 614/8140	Daily	Batch			Batch						Sample
EPA 615/8150	Daily	Batch			Batch						
EPA 625/8270	Daily	Batch			Batch						Sample
EPA 632	Daily	Batch			Batch						
TOC	Daily	Batch			Batch			Batch			
TOX	Daily	Batch			Batch			Batch			
TPH by IR	Daily	Batch	Batch			Batch		Batch			
<u>Volatile Organics</u>											
EPA 601/8010	Daily	Batch			Batch			Batch		Sample	Sample
EPA 602/8020	Daily	Batch			Batch			Batch		Sample	
EPA 624/8240	Daily	Batch			Batch			Batch		Sample	Sample
<u>Inorganic Chemicals</u>											
Alkalinity	Daily				Batch				Batch		
Ammonia	Daily	Batch			Batch			Batch			
BOD	Daily	Batch				Batch			Batch		
Carbon Dioxide										Batch	
COD	Daily	Daily				Batch		Batch			

**Internal Quality Control**

**Table 11-2 Quality Controls for Wastewater / Hazardous Waste Liquid Methods**

<u>TEST</u>	<u>DLS</u>	<u>INST BLANK</u>	<u>METHOD BLANK</u>	<u>CCV</u>	<u>ICV</u>	<u>LCS</u>	<u>BS/BSD</u>	<u>MS/MSD</u>	<u>DUP</u>	<u>SURR</u>	<u>I.S.</u>
<b><u>Inorganic Chemicals continued</u></b>											
COD, % Transmittance	Daily	Daily				Batch		Batch			
Cl Res., colorimetric	Daily	Batch			Batch				Batch		
Cl Res., titrimetric					Batch				Batch		
Cyanide, Free	Daily	Batch			Batch			Batch			
Cyanide, Total	Daily	Batch	Batch	Batch			Batch	Batch			
E.C.	Daily				Batch				Batch		
Fluoride (Distillation)		Batch	Batch			Batch		Batch			
Fluoride	Daily	Batch			Batch			Batch			
Gen. Physical									Batch		
Ignitability				Batch					Batch		
Ion Chromatography	Daily	Batch			Batch			Batch			
MBAS Extraction	Daily	Batch				Batch		Batch			
MBAS Screen									Batch		
Moisture, percent										Batch	
Oxygen, Dissolved									Batch		
Nitrate - Technicon	Daily	Batch			Batch			Batch			
Nitrite - Technicon	Daily	Batch			Batch			Batch			
Oil & Grease, Pet	Daily	Batch				Batch	Batch				
Oil & Grease, Sox	Daily	Batch				Batch	Batch				
Oil & Grease	Daily	Batch				Batch	Batch				
pH					Batch				Batch		
pH, Adjustment										Batch	
Phenols	Daily	Batch	Batch			Batch		Batch			
Phosphorus, Total	Daily	Batch	Batch			Batch		Batch			
Reactivity, Generation									Batch		
Reactivity									Batch		
Solids, Fixed	Daily	Batch				Batch			Batch		
Solids, Settleable											
Solids, Total	Daily	Batch				Batch			Batch		
Solids, T. Dissolved	Daily	Batch				Batch			Batch		
Solids, T. Suspended	Daily	Batch				Batch			Batch		



Internal Quality Control

Table 11-2 Quality Controls for Wastewater / Hazardous Waste Liquid Methods

<u>TEST</u>	<u>DLS</u>	<u>INST BLANK</u>	<u>METHOD BLANK</u>	<u>CCV</u>	<u>ICV</u>	<u>LCS</u>	<u>BS/BSD</u>	<u>MS/MSD</u>	<u>DUP</u>	<u>SURR</u>	<u>I.S.</u>
<u>Inorganic Chemicals continued</u>											
Solids, Volatile	Daily	Batch							Batch		
Solids, V. Suspended	Daily	Batch							Batch		
Sulfide, Diss									Batch		
Sulfide, Total									Batch		
Sulfite									Batch		
TKN	Daily	Batch				Batch		Batch			
Tannin & Lignin	Daily	Batch				Batch		Batch			
<u>Trace Metals</u>											
3015			Batch			Batch		Batch			
STLC			Batch						Batch		
TCLP			Batch			Batch		Batch			
Cr VI	Daily	Batch	Batch			Batch		Batch			
FAA	Daily	Batch			Batch						
GFAA	Daily	Batch			Batch						
ICP	Daily	Batch			Batch						
ICP/MS	Daily	Batch			Batch						Sample
Hg - CVAA	Daily	Batch			Batch						
<u>Radiochemistry</u>											
Gross A & B		Batch					Batch				
Nuclide Screen		Batch					Batch				
Radium 226 & 228		Batch					Batch				
Radon									Batch		
Strontium 90		Batch					Batch				
Tritium		Batch					Batch				
Uranium		Batch					Batch				

Internal Quality Control

Table 11-3 Quality Controls for Solid Waste / Hazardous Waste Methods

<u>TEST</u>	<u>DLS</u>	<u>INST BLANK</u>	<u>METHOD BLANK</u>	<u>CCV</u>	<u>ICV</u>	<u>LCS</u>	<u>BS/BSD</u>	<u>MS/MSD</u>	<u>DUP</u>	<u>SURR</u>	<u>I.S.</u>
<u>Semivolatile Organics</u>											
EPA 3510			Batch			Batch		Batch			
EPA 3520			Batch			Batch		Batch			
EPA 3540			Batch			Batch		Batch			
EPA 3550			Batch			Batch		Batch			
EPA 3580			Batch			Batch			Batch		
TCLP			Batch						Batch		
EPA 8015	Daily	Batch			Batch						
EPA 8015M (Diesel)	Daily	Batch			Batch						
EPA 8015M (Gas)	Daily	Batch			Batch						Sample
EPA 8040	Daily	Batch			Batch						Sample
EPA 8080	Daily	Batch			Batch						
EPA 8140	Daily	Batch			Batch						Sample
EPA 8150	Daily	Batch			Batch						
EPA 8310	Daily	Batch			Batch						
EPA 632	Daily	Batch			Batch						
EPA 8270	Daily	Batch			Batch						
TOC	Daily	Batch			Batch			Batch			
TOX	Daily	Batch			Batch			Batch			
TPH by IR	Daily	Batch	Batch		Batch			Batch			
<u>Volatile Organics</u>											
TCLP			Batch						Batch		
EPA 601/8010	Daily	Batch			Batch			Batch		Sample	Sample
EPA 602/8020	Daily	Batch			Batch			Batch		Sample	
EPA 624/8240	Daily	Batch			Batch			Batch		Sample	Sample
EPA 8260	Daily	Batch			Batch			Batch		Sample	Sample

**Internal Quality Control**

**Table 11-3 Quality Controls for Solid Waste / Hazardous Waste Methods**

<b>TEST</b>	<b><u>DLS</u></b>	<b><u>INST BLANK</u></b>	<b><u>METHOD BLANK</u></b>	<b><u>CCV</u></b>	<b><u>ICV</u></b>	<b><u>LCS</u></b>	<b><u>BS/BSD</u></b>	<b><u>MS/MSD</u></b>	<b><u>DUP</u></b>	<b><u>SURR</u></b>	<b><u>I.S.</u></b>
<b><u>Solids Inorganic Chemicals</u></b>											
Ammonia	Daily	Batch				Batch		Batch			
Corrosivity (pH)					Batch				Batch		
Cyanide, Total	Daily	Batch	Batch	Batch			Batch		Batch		
E.C.	Daily				Batch				Batch		
Fluoride (Distillation)		Batch	Batch			Batch		Batch			
Ignitability				Batch					Batch		
Ion Chromatography	Daily	Batch				Batch		Batch			
Moisture, percent										Batch	
Nitrate - Technicon	Daily	Batch				Batch		Batch			
Nitrite - Technicon	Daily	Batch				Batch		Batch			
Oil & Grease, Sox	Daily	Batch				Batch	Batch				
Oil & Grease	Daily	Batch				Batch	Batch				
pH				Batch					Batch		
Phenols	Daily	Batch	Batch			Batch		Batch			
Phosphorus (See Trace metals - ICP)											
Reactivity, Generation									Batch		
Reactivity									Batch		
Solids, Percent									Batch		
Sulfide, Total									Batch		
TKN	Daily	Batch				Batch	Batch	Batch			
<b><u>Trace Metals</u></b>											
3050			Batch			Batch		Batch			
STLC			Batch						Batch		
TCLP			Batch			Batch		Batch			
Cr VI	Daily	Batch	Batch			Batch		Batch			
FAA	Daily	Batch			Batch						
GFAA	Daily	Batch			Batch						
ICP	Daily	Batch			Batch						
ICP/MS	Daily	Batch			Batch						
Hg - CVAA	Daily	Batch			Batch						Sample

Internal Quality Control

Table 11-3 Quality Controls for Solid Waste / Hazardous Waste Methods

<u>TEST</u>	<u>DLS</u>	<u>INST BLANK</u>	<u>METHOD BLANK</u>	<u>CCV</u>	<u>ICV</u>	<u>LCS</u>	<u>BS/BSD</u>	<u>MS/MSD</u>	<u>DUP</u>	<u>SURR</u>	<u>I.S.</u>
<u>Radiochemistry</u>											
Gross A & B		Batch					Batch				
Nuclide Screen		Batch					Batch				
Radium 226 & 228		Batch					Batch				
Radon									Batch		
Strontium 90		Batch					Batch				
Tritium		Batch					Batch				
Uranium		Batch					Batch				

## **Internal Quality Control Checks**

### **Figure 11-1 FGL Control Chart for LCS**

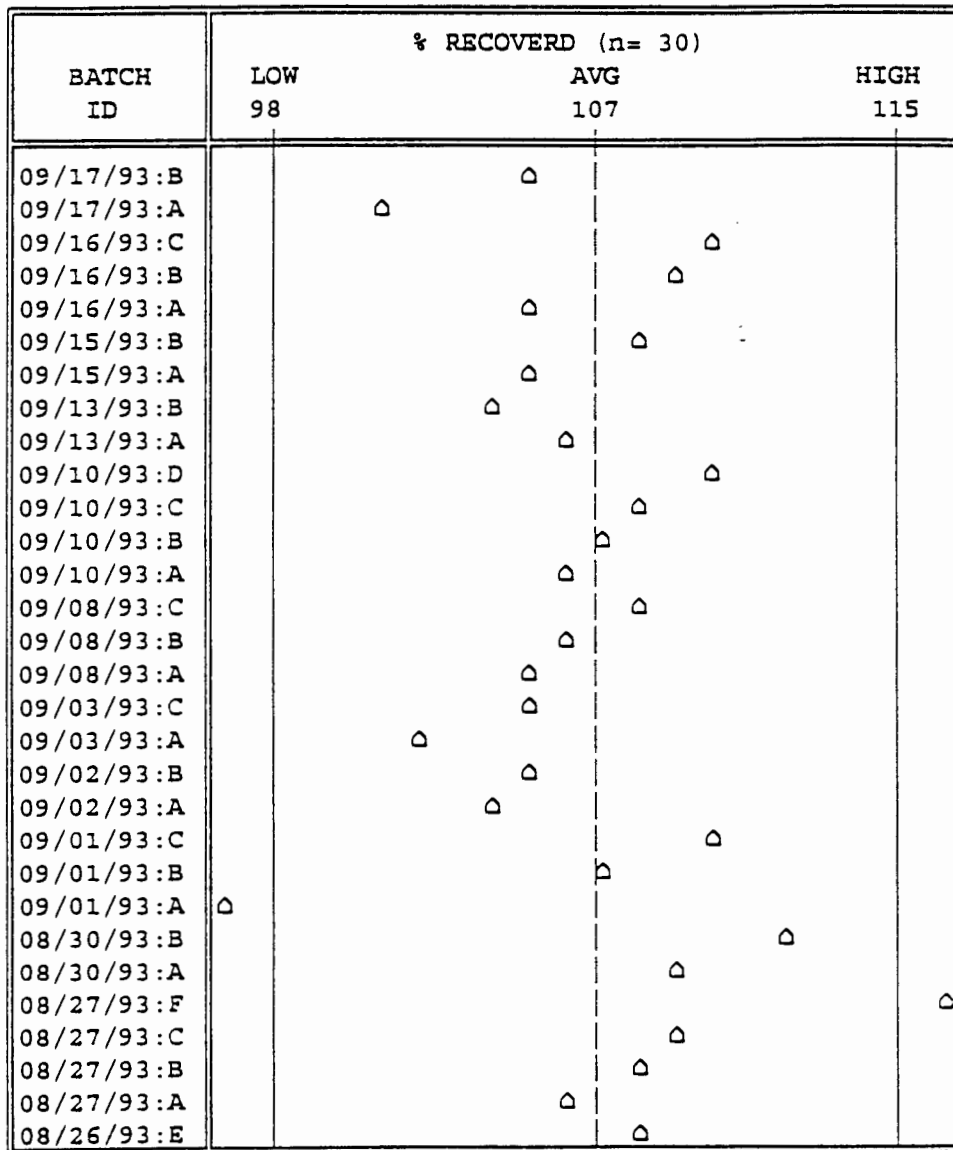
**This page intentionally left blank for figures on next 2 pages.**

# QALCS-LBW

FGL ENVIRONMENTAL TREND CONTROL CHART

## 300.0 Anions for CL

09/23/93



△/■ => Matrix Spike / Dup

Reporting Limits : AR % 98 - 115 MAV % on 9/23/93 by: Q / 10/18/93 EA

*Handwritten signature: KRW*

# QALCS-LBW

FGL ENVIRONMENTAL TREND CONTROL CHART

## 300.0 Anions for CL

09/23/93

BATCH ID	DATE COMPLETED	Theo. Conc.	MS %	MSD %	AR %	See Notes
09/17/93:B	09/17/93	213	105	75-125		
09/17/93:A	09/17/93	213	101	75-125		
09/16/93:C	09/16/93	213	110	75-125		
09/16/93:B	09/16/93	213	109	75-125		
09/16/93:A	09/16/93	213	105	75-125		1
09/15/93:B	09/15/93	213	108	75-125		
09/15/93:A	09/15/93	213	105	75-125		
09/13/93:B	09/13/93	213	104	75-125		
09/13/93:A	09/13/93	213	106	75-125		
09/10/93:D	09/10/93	213	110	75-125		
09/10/93:C	09/10/93	213	108	75-125		
09/10/93:B	09/10/93	213	107	75-125		
09/10/93:A	09/10/93	213	106	75-125		
09/08/93:C	09/08/93	213	108	75-125		
09/08/93:B	09/08/93	213	106	75-125		
09/08/93:A	09/08/93	213	105	75-125		
09/03/93:C	09/03/93	213	105	75-125		
09/03/93:A	09/03/93	213	102	75-125		
09/02/93:B	09/02/93	213	105	75-125		
09/02/93:A	09/02/93	213	104	75-125		
09/01/93:C	09/01/93	213	110	75-125		
09/01/93:B	09/01/93	213	107	75-125		
09/01/93:A	09/01/93	213	95.2	75-125		
08/30/93:B	08/30/93	213	112	75-125		
08/30/93:A	08/30/93	213	109	75-125		
08/27/93:F	08/27/93	213	121	75-125		
08/27/93:C	08/27/93	213	109	75-125		
08/27/93:B	08/27/93	213	108	75-125		
08/27/93:A	08/27/93	213	106	75-125		
08/26/93:E	08/26/93	213	108	75-125		

## **Internal Quality Control Checks**

**Figure 11-2 FGL Control Chart for MS/MSD and RPD**

**This page intentionally left blank for figures on next 2 pages.**

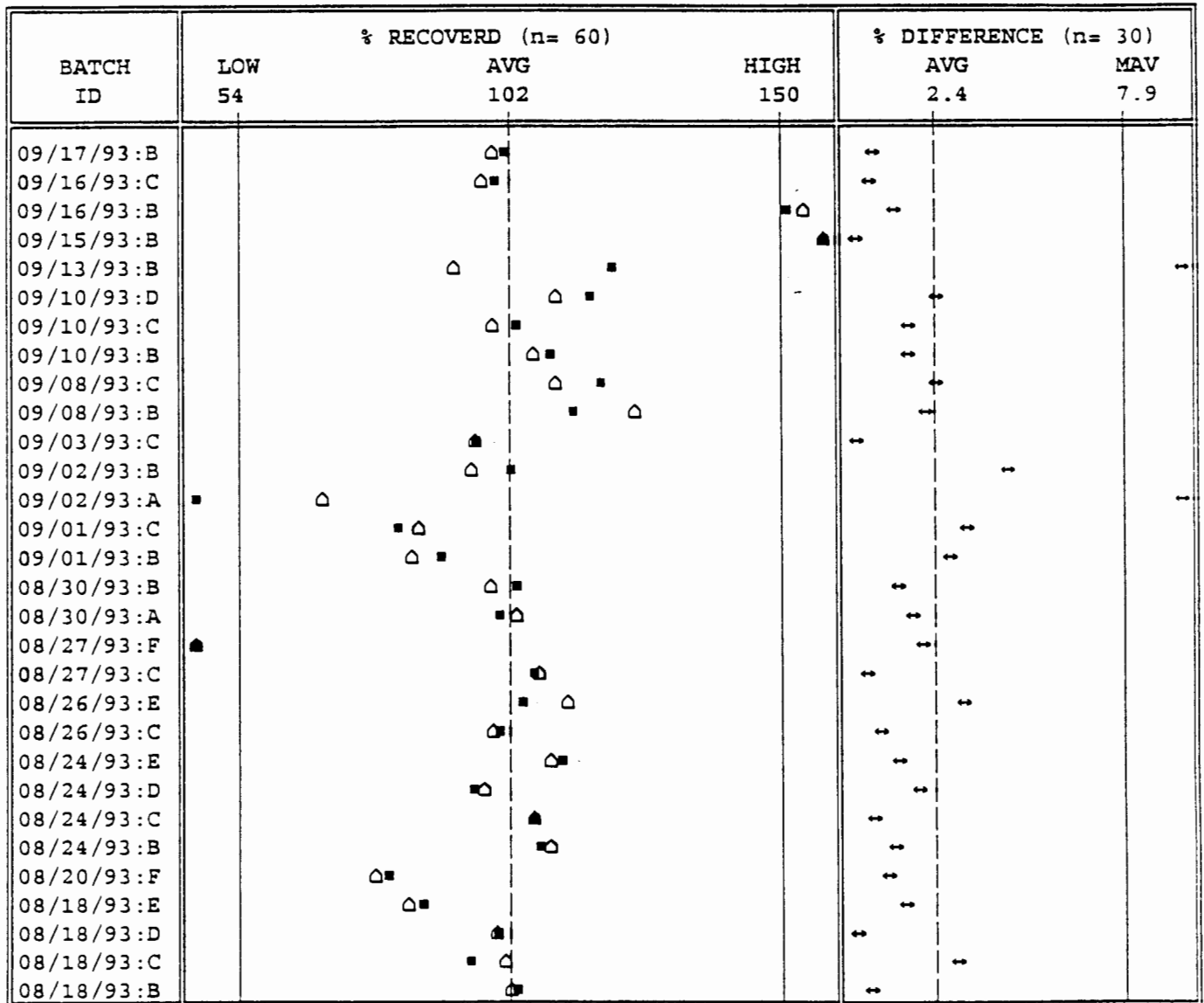


# QAMS-WW

FGL ENVIRONMENTAL TREND CONTROL CHART

## 300.0 Anions for CL

09/23/93



△/■ => Matrix Spike / Dup

↔ => % Difference

Reporting Limits : 54 - 150 <sup>AR %</sup> 7.9 <sup>MAV %</sup> on 9/23/93 by: CS / 10/18/93 SA

OK  
KRW

**QAMS-WW****FGL ENVIRONMENTAL TREND CONTROL CHART****300.0 Anions for CL**

09/23/93

BATCH ID	DATE COMPLETED	Theo. Conc.	MS %	AR %	DIFF. %	MAV %	See Notes
09/17/93:B	09/17/93	100	98.9	101	75-125	0.6	20.0 10
09/16/93:C	09/16/93	40.0	96.9	99.3	75-125	0.5	20.0
09/16/93:B	09/16/93	100	154	151	75-125	1.2	20.0 *
09/15/93:B	09/15/93	145	180	180	75-125	0.1	20.0 *
09/13/93:B	09/13/93	100	92.0	120	75-125	13.4	20.0 *
09/10/93:D	09/10/93	100	110	116	75-125	2.4	20.0
09/10/93:C	09/10/93	200	98.9	103	75-125	1.6	20.0
09/10/93:B	09/10/93	100	106	109	75-125	1.6	20.0
09/08/93:C	09/08/93	100	110	118	75-125	2.4	20.0 10
09/08/93:B	09/08/93	200	124	113	75-125	2.1	20.0
09/03/93:C	09/03/93	100	95.7	95.8	75-125	0.1	20.0
09/02/93:B	09/02/93	100	95.0	102	75-125	4.5	20.0
09/02/93:A	09/02/93	100	68.6	46.0	75-125	14.1	20.0 10
09/01/93:C	09/01/93	200	85.7	82.0	75-125	3.3	20.0 13
09/01/93:B	09/01/93	200	84.5	89.7	75-125	2.8	20.0
08/30/93:B	08/30/93	100	98.5	103	75-125	1.3	20.0
08/30/93:A	08/30/93	100	103	100	75-125	1.7	20.0
08/27/93:F	08/27/93	4000	45.7	38.0	75-125	2.0	20.0 10
08/27/93:C	08/27/93	100	107	106	75-125	0.4	20.0 10
08/26/93:E	08/26/93	200	112	104	75-125	3.2	20.0 10
08/26/93:C	08/26/93	40.0	98.9	100	75-125	0.8	20.0
08/24/93:E	08/24/93	50.0	109	111	75-125	1.3	20.0
08/24/93:D	08/24/93	625	97.2	95.3	75-125	1.9	20.0
08/24/93:C	08/24/93	250	106	106	75-125	0.6	20.0 13
08/24/93:B	08/24/93	250	109	107	75-125	1.2	20.0
08/20/93:F	08/20/93	50.0	77.9	80.3	75-125	1.0	20.0
08/18/93:E	08/18/93	250	83.8	86.4	75-125	1.5	20.0 13
08/18/93:D	08/18/93	100	99.5	99.7	75-125	0.1	20.0 10
08/18/93:C	08/18/93	100	101	94.7	75-125	3.0	20.0 10
08/18/93:B	08/18/93	40.0	102	103	75-125	0.5	20.0 13

## **Performance and System Audits**

The Quality Assurance Director or Officer is responsible for internal system audits, coordinating all external audits and performance evaluation (PE) samples. In addition, the QA Director or Officer is responsible for maintaining state and agency certification.

### **12.1 System Audits**

System audits are performed both by external agencies, and by the laboratory Quality Assurance group. The focus of these audits is the overall analytical "system", from login to delivery of the finished reports. The purpose of the audit is to document compliance with the specified methodology contained in our Standard Operating Procedures (SOPs).

#### **12.1.1 Internal System Audit Program**

Internal system audits are conducted on a monthly basis. Several analytical methods are selected each month for a systems audit. Compliance with all the required QC is evaluated and indicated on the QA inspection summary report form (figure 16-1). This report contains all the new nonconformance items, previously uncompleted non-conformance items and finally all non-conformance items completed. Dates are recorded when the non-conformance was found and when it was completed. This report is given to all supervisors and managers. With these steps an ongoing quantitative assessment of the analytical system is provided.

#### **12.1.2 External System Audits**

System audits are performed by outside government agencies such as the California Department of Health Services, Lawrence Livermore National Laboratory and the Army Corp of Engineers. Audits are also performed by private agencies such as Chemical Waste Management, Inc.

### **12.2 Performance Evaluation Samples**

Performance evaluation audits are used to provide a direct evaluation of the ability of the analytical systems to generate data that is consistent with the laboratory's stated objectives for accuracy and precision. External PE samples are analyzed as part of the certification and approval process for various state and federal agencies, as well as for other organizations.

#### **12.2.1 External Performance Evaluation Samples**

Performance evaluation samples are analyzed for a number of outside agencies including:

- (1) USEPA semi-annual drinking water check samples (WS series)
- (2) USEPA semi-annual wastewater check samples (WP series)
- (3) USEPA annual wastewater check samples (DMR studies)
- (4) EMSL, Las Vegas, radiochemistry check samples
- (5) Environmental Research Associates check samples

### **12.3 Certifications, Accreditations and Agency Approvals**

FGL Environmental participates in laboratory certification programs with California, and other states. A copy of the California Environmental Laboratory Accreditation Program (ELAP) approved analyses list may be found in Figures 12-3 and 12-4. A copy of the Nevada Department of Human Resources approved analyses list may be found in Figure 12-5.

## **Performance and System Audits**

### **Figure 12-1 FGL QA Inspection Form**

**This page intentionally left blank for figures on next 4 pages.**

## FGL QC Inspection Report

Date: \_\_\_\_\_

Inspector: \_\_\_\_\_

<u>Item</u>	<u>In Compliance?</u>	<u>Corrective Action</u>	<u>Due by</u>
<b>Overall -</b>			
Oven Temps	_____	_____	_____
Ref. Temps	_____	_____	_____
Balance Checks	_____	_____	_____
Container Checks	_____	_____	_____
QC SOP's	_____	_____	_____

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Front Office and Login -

Sample #'s - \_\_\_\_\_

LIMS Logbook	_____	_____	_____
File Tracking	_____	_____	_____
Chain of Custody	_____	_____	_____
Report	_____	_____	_____
Bill	_____	_____	_____
Training	_____	_____	_____
SOP's	_____	_____	_____

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Bacteriology -

D.W. Prep Log	_____	_____	_____
W.W. Prep Log	_____	_____	_____
P.C. Prep Log	_____	_____	_____
Client Notifications	_____	_____	_____
Media Prep Log	_____	_____	_____
Autoclave Temps	_____	_____	_____
Incubator Temps	_____	_____	_____
Water Suitability	_____	_____	_____
Corrective Action Log	_____	_____	_____

### Bact Method Check

Method: _____	Sample #: _____	Date Comp: _____
Analyst Training	_____	_____
SOP	_____	_____

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

<u>Item</u>	<u>In Compliance?</u>	<u>Corrective Action</u>	<u>Due by</u>
<b>Inorganics -</b>			
Standard Prep Log			
Corrective Action Log			
Water Suitability			
Instrument Maint.			
Dionex DX-300			
P.E. Lambda 3			
Turner Nephelometer			
Fisher pH/ISE			
Orion E.C.			
Orion BOD			
P.E. 5000			
P.E. 5100			
Fisons PQ-II			
Leeman PS200			

#### Wet Chemistry Method Check

Method: \_\_\_\_\_

Sample #: \_\_\_\_\_ Date Comp: \_\_\_\_\_

Data Package

  Batch QC Report

  Reviewed Report

  Batch Sheet

  Inst. Printout

Control Charts

Analyst Training

SOP

Method: \_\_\_\_\_

Sample #: \_\_\_\_\_ Date Comp: \_\_\_\_\_

Data Package

  Batch QC Report

  Reviewed Report

  Batch Sheet

  Inst. Printout

Control Charts

Analyst Training

SOP

#### Metals Method Check

Method: \_\_\_\_\_

Sample #: \_\_\_\_\_ Date Comp: \_\_\_\_\_

Data Package

  Batch QC Report

  Reviewed Report

  Batch Sheet

  Inst. Printout

Control Charts

Analyst Training

SOP

Comments: \_\_\_\_\_

\_\_\_\_\_

<u>Item</u>	<u>In Compliance?</u>	<u>Corrective Action</u>	<u>Due by</u>
<b>Organics -</b>			
<b>GC Lab:</b>			
Standard prep Log GC	_____	_____	_____
Corrective Action Log	_____	_____	_____
Instrument Maint.			
GC 1	_____	_____	_____
GC 2	_____	_____	_____
GC 4	_____	_____	_____
GC 5	_____	_____	_____
GC 6	_____	_____	_____
GC 7	_____	_____	_____
GC 8	_____	_____	_____
Hitachi HPLC	_____	_____	_____
HP HPLC	_____	_____	_____
IR	_____	_____	_____

GC Lab Method Check

Method: \_\_\_\_\_

Sample #: \_\_\_\_\_ Date Comp: \_\_\_\_\_

Data Package

Batch QC Report

Reviewed Report

Batch Sheet

Inst. Printout

Control Charts

Analyst Training

SOP

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

**GC/MS Lab:**

Standard prep Log GC/MS

Corrective Action Log

Instrument Maint.

GC/MS 1

GC/MS 2

GC/MS 3

GC/MS 4

MCI TOX

Astro TOC

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

GC/MS Lab Method Check

Method: \_\_\_\_\_

Sample #: \_\_\_\_\_ Date Comp: \_\_\_\_\_

Data Package

Batch QC Report

Reviewed Report

Batch Sheet

Inst. Printout

Control Charts

Analyst Training

SOP

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

<u>Item</u>	<u>In Compliance?</u>	<u>Corrective Action</u>	<u>Due by</u>
<b>Radioactivity -</b>			
Standard Prep. Log			
Corrective Action Log			
Instrument Maint.			
Alpha 1			
Alpha 2			
Alpha 5			
Alpha 6			
Alpha 7			
Alpha/Beta 3			
Alpha/Beta 4			
Alpha/Beta 8			
Liquid Scint.			

#### Radiochemistry Method Check

Method: _____	Sample #: _____	Date Comp: _____
Data Package		
Batch QC Report		
Reviewed Report		
Batch Sheet		
Inst. Printout		
Control Charts		
Background Dump		
Efficiency Report		
Analyst Training		
SOP		

Comments: \_\_\_\_\_

#### Ag Lab -

Standard Prep. Log			
Corrective Action Log			
Instrument Maint.			
Technicon - nitrate			
Technicon - TKN			
LECO			
pH meter			
E.C. meter			
ARL 3410			

#### Ag Method Check

Method: _____	Sample #: _____	Date Comp: _____
Data Package		
Batch QC Report		
Reviewed Report		
Batch Sheet		
Inst. Printout		
Control Charts		
Analyst Training		
SOP		

Comments: \_\_\_\_\_



## **Performance and System Audits**

### **Figure 12-2 FGL Santa Paula - CA DHS ELAP Certification**

**This page intentionally left blank for figures on next 5 pages.**

ENVIRONMENTAL LABORATORY ACCREDITATION/REGISTRATION  
List of Approved Fields of Testing and Analytes

FGL Environmental Laboratory  
853 Corporation Street  
Santa Paula, CA

TELEPHONE No: (805) 659-0910  
CALIFORNIA COUNTY: Ventura

CERTIFICATE NUMBER: 1573  
EXPIRATION DATE: 7/31/95

<b>1 Microbiology of Drinking Water and Wastewater (07-15-91)</b>			
1.1	Total Coliforms in Drinking Water by Multiple Tube Fermentation	-----	Y
1.2	Fecal Coliforms/E. Coli in Drinking Water by MTF	-----	Y
1.3	Total Coliforms in Drinking Water by Membrane Filter Technics	-----	N
1.4	Fecal Coliforms/E. Coli in Drinking Water by Membrane Filter Technics	-----	N
1.5	Total Coliforms and E. Coli in Drinking Water by MMO-MUG	-----	Y
1.6	Total Coliforms in Drinking Water by Clark's Presence/Absence	-----	N
1.7	Fecal Coliforms/E. Coli in Drinking Water by Clark's Presence/Absence	-----	N
1.8	Heterotrophic Plate Count	-----	Y
1.9	Total Coliforms in Wastewater by Multiple Tube Fermentation	-----	Y
1.10	Fecal Coliforms in Wastewater by MTF	-----	Y
1.11	Total Coliforms in Wastewater by Membrane Filter Technics	-----	N
1.12	Fecal Coliforms in Wastewater by Membrane Filter Technics	-----	N
1.13	Fecal Streptococci or Enterococci by Multiple Tube Technics	-----	N
1.14	Fecal Streptococci or Enterococci by Membrane Filter Technics	-----	N
<b>2 Inorganic Chemistry and Physical Properties of Drinking Water excluding Toxic Chemical Elements (07-15-91)</b>			
2.1	Alkalinity	----- Y	
2.2	Calcium	----- Y	
2.3	Chloride	----- Y	
2.4	Corrosivity	----- Y	
2.5	Fluoride	----- Y	
2.6	Hardness	----- Y	
2.7	Magnesium	----- Y	
2.8	MBAS	----- Y	
2.9	Nitrate	----- Y	
2.10	Nitrite	----- Y	
2.11	Sodium	----- Y	
2.12	Sulfate	----- Y	
2.13	Total Filterable Residue and Conductivity	----- Y	
2.14	Iron (Colorimetric Methods Only)	----- N	
2.15	Manganese (Colorimetric Methods Only)	----- N	
2.16	Phosphate, ortho	----- Y	
2.17	Silica (Colorimetric Methods Only)	----- N	
2.18	Cyanide	----- Y	
<b>3 Analysis of Toxic Chemical Elements in Drinking Water (07-15-91)</b>			
3.1	Arsenic	----- Y	
3.2	Barium	----- Y	
3.3	Cadmium	----- Y	
3.4	Chromium, total	----- Y	
3.5	Copper	----- Y	
3.6	Iron	----- Y	
3.7	Lead	----- Y	
3.8	Manganese	----- Y	
3.9	Mercury	----- Y	
3.10	Selenium	----- Y	
3.11	Silver	----- Y	
3.12	Zinc	----- Y	
3.13	Aluminum	----- Y	
3.14	Asbestos	----- N	
3.15	EPA Method 200.7	----- Y	
3.16	EPA Method 200.8 (Unregulated Elements and Lead Only)	----- Y	
3.17	Antimony	----- Y	
3.18	Beryllium	----- Y	
3.19	Nickel	----- Y	
3.20	Thallium	----- Y	
<b>4 Organic Chemistry of Drinking Water (measurement by GC/MS combination) (07-15-91)</b>			
4.1	EPA Method 501.3	----- N	
4.2	EPA Method 524.2	----- Y	
4.3	EPA Method 525	----- Y	
4.4	EPA Method 513	----- N	
<b>5 Organic Chemistry of Drinking Water (excluding measurements by GC/MS combination) (07-15-91)</b>			
5.1	EPA Method 501.1	----- N	
5.2	EPA Method 501.2	----- Y	
5.3	EPA Method 502.1	----- N	
5.4	EPA Method 502.2	----- N	
5.5	EPA Method 503.1	----- N	
5.6	EPA Method 504	----- Y	
5.7	EPA Method 505	----- Y	
5.8	EPA Method 506	----- N	
5.9	EPA Method 507	----- Y	
5.10	EPA Method 508	----- Y	
5.11	EPA Method 508A	----- Y	
5.12	EPA Method 510.1	----- N	
5.13	EPA Method 515.1	----- Y	
5.14	EPA Method 531.1	----- Y	
5.15	EPA Method 547	----- Y	
5.16	EPA Method 548	----- Y	
5.17	EPA Method 549	----- Y	
5.18	EPA Method 550	----- Y	
5.19	EPA Method 550.1	----- N	
5.20	EPA Method 551	----- Y	
5.21	EPA Method 552	----- Y	

CERTIFICATE NUMBER: 1573  
EXPIRATION DATE: 7/31/95

#### 6 Radiochemistry (07-15-91)

6.1	Gross Alpha and Beta Radiation -----	Y	6.11	Gross Alpha by Co-precipitation -----	Y
6.2	Total Radium -----	Y	6.12	Radium 228 -----	Y
6.3	Radium 226 -----	Y	6.13	Radioactive Iodine -----	N
6.4	Uranium -----	Y	6.14	Gross Alpha & Beta in Hazardous Wastes --	Y
6.5	Radon 222 -----	Y	6.15	Alpha Emitting Radium Isotopes in Haz. Wastes -----	Y
6.6	Radioactive Cesium -----	N	6.16	Radium 228 in Hazardous Wastes -----	Y
6.7	Iodine 131 -----	N			
6.8	Radioactive Strontium -----	Y			
6.9	Tritium -----	Y			
6.10	Gamma and Photon Emitters -----	N			

#### 7 Shellfish Sanitation (-----)

7.1	Shellfish meat Microbiology -----	N
7.2	Paralytic Shellfish Poison -----	N
7.3	Domoic Acid -----	N

#### 8 Aquatic Toxicity Bioassays (-----)

8.1	Hazardous Waste Aquatic Toxicity Bioassay (Title 22, CCR, 66261.24(a)(6)) -----	N
8.2	Wastewater Testing According to Kopperdahl (1976) using Freshwater Fish. -----	N
8.3	Wastewater Testing According to EPA/600/4-85/013 using Freshwater and/or Marine Organisms -----	N
8.4	Wastewater Testing by EPA Method 1000.0 -----	N
8.5	Wastewater Testing by EPA Method 1002.0 -----	N
8.6	Wastewater Testing by EPA Method 1003.0 -----	N
8.7	Wastewater Testing by EPA Method 1006 -----	N
8.8	Wastewater Testing by EPA Method 1007 -----	N
8.9	Wastewater Testing by EPA Method 1009 -----	N
8.10	Wastewater Testing According to Anderson, et. al. (1990) using Giant Kelp ( <i>Macrocystis pyrifera</i> ) --	N
8.11	Wastewater Testing According to Anderson, et. al. (1990) using Red Abalone ( <i>Haliotis rufescens</i> ) ---	N
8.12	Wastewater Testing According to Dinnel and Stober (1987) using Purple Sea Urchin ( <i>Strongylocentrotus purpuratus</i> ) -----	N
8.13	Wastewater Testing According to Dinnel and Stober (1987) using Red Sea Urchin ( <i>Strongylocentrotus franciscanus</i> ) -----	N
8.14	Wastewater Testing According to Dinnel and Stober (1987) using Sand Dollar ( <i>Dendraster excentricus</i> ) -----	N
8.15	Wastewater Testing According to procedure E 724-89 (ASTM, 1989) using Pacific Oyster ( <i>Crassostrea gigas</i> ) -----	N
8.16	Wastewater Testing According to procedure E 724-89 (ASTM, 1989) using California Bay Mussel ( <i>Mytilus edulis</i> ) -----	N
8.17	Wastewater Testing According to Standard Methods (APHA, 1989) using an alga ( <i>Skeletonema costatum</i> ) -----	N
8.18	Wastewater Testing According to EPA/600/4-90/027 using Freshwater and/or Marine Organisms -----	N

#### 9 Physical Properties Testing of Hazardous Waste (07-15-91)

9.1	Ignitability by Flashpoint determination (Title 22, CCR, 66261.21) -----	Y
9.2	Corrosivity - pH determination (Title 22, CCR, 66261.22) -----	Y
9.3	Corrosivity - Corrosivity towards steel (Title 22, CCR, 66261.22) -----	N
9.4	Reactivity (Title 22, CCR, 66261.23) -----	Y

#### 10 Inorganic Chemistry and Toxic Chemical Elements of Hazardous Waste

10.1	Antimony 7040(-----) -----	N	10.7	Cobalt 7200(-----) -----	N
	7041(06-06-86) -----	Y		7201(-----) -----	N
10.2	Arsenic 7060(06-06-86) -----	Y	10.8	Copper 7210(06-06-86) -----	Y
	7061(-----) -----	N		7211(-----) -----	N
10.3	Barium 7080(-----) -----	N	10.9	Lead 7420(06-06-86) -----	Y
	7081(-----) -----	N		7421(06-06-86) -----	Y
10.4	Beryllium 7090(-----) -----	N	10.10	Mercury 7470(06-06-86) -----	Y
	7091(-----) -----	N		7471(11-30-93) -----	Y
10.5	Cadmium 7130(-----) -----	N	10.11	Molybdenum 7480(-----) -----	N
	7131(06-06-86) -----	Y		7481(11-30-93) -----	Y
10.6	Chromium, total 7190(-----) -----	N	10.12	Nickel 7520(06-06-86) -----	Y
	7191(11-30-93) -----	Y			

CERTIFICATE NUMBER: 1573  
EXPIRATION DATE: 7/31/95

10.13	Selenium				
	7740(06-06-86)	-----	Y		
	7741(-----)	-----	N		
10.14	Silver				
	7760(06-06-86)	-----	Y		
	7761(-----)	-----	N		
10.15	Thallium				
	7840(-----)	-----	N		
	7841(06-06-86)	-----	Y		
10.16	Vanadium				
	7910(-----)	-----	N		
	7911(-----)	-----	N		
10.17	Zinc				
	7950(06-06-86)	-----	Y		
	7951(-----)	-----	N		
10.18	Chromium (VI)				
	7195(-----)	-----	N		
	7196(06-06-86)	-----	Y		
	7197(-----)	-----	N		
	7198(-----)	-----	N		
10.19	Cyanide				
	9010(06-06-86)	-----	Y		
10.20	Fluoride				
	300.0(11-30-93)	-----	Y		
	340.1(-----)	-----	N		
	340.2(06-06-86)	-----	Y		
	340.3(-----)	-----	N		
10.21	Sulfide				
	9030(06-06-86)	-----	Y		
10.22	Total Organic Lead				
	(-----)	-----	N		
10.23	EPA Method 6010(06-06-86)	-----	Y		
10.24	EPA Method 6020(11-30-93)	-----	Y		

11 Extraction Tests of Hazardous Waste (06-06-86)

11.1	California Waste Extraction Test (WET) (Title 22, CCR, 66261.100, Appendix II)	-----	Y
11.2	Extraction Procedure Toxicity	-----	Y
11.3	Toxicity Characteristic Leaching Procedure (TCLP) All Classes	-----	Y
11.4	Toxicity Characteristic Leaching Procedure (TCLP) Inorganics Only	-----	N
11.5	Toxicity Characteristic Leaching Procedure (TCLP) Extractables Only	-----	N
11.6	Toxicity Characteristic Leaching Procedure (TCLP) Volatiles Only	-----	N

12 Organic Chemistry of Hazardous Waste (measurement by GC/MS combination)

12.1	EPA Method 8240(02-05-87)	-----	Y
12.2	EPA Method 8250(-----)	-----	N
12.3	EPA Method 8270(02-05-87)	-----	Y
12.4	EPA Method 8280(-----)	-----	N
12.5	EPA Method 8290(-----)	-----	N
12.6	EPA Method 8260(11-30-93)	-----	Y

13 Organic Chemistry of Hazardous Waste (excluding measurements by GC/MS combination)

13.1	EPA Method 8010(-----)	-----	N	13.13	EPA Method 8310(05-27-92)	-----	Y
13.2	EPA Method 8015(01-09-90)	-----	Y	13.14	EPA Method 632 (07-15-91)	-----	Y
13.3	EPA Method 8020(06-06-86)	-----	Y	13.15	Total Petroleum Hydrocarbons		
13.4	EPA Method 8030(-----)	-----	N		(LUFT Manual) (06-06-86)	-----	Y
13.5	EPA Method 8040(-----)	-----	N	13.16	EPA Method 8011(11-08-87)	-----	Y
13.6	EPA Method 8060(-----)	-----	N	13.17	EPA Method 8021(-----)	-----	N
13.7	EPA Method 8080(06-06-86)	-----	Y	13.18	EPA Method 8070(-----)	-----	N
13.8	EPA Method 8090(-----)	-----	N	13.19	EPA Method 8110(-----)	-----	N
13.9	EPA Method 8100(-----)	-----	N	13.20	EPA Method 8141(11-30-93)	-----	Y
13.10	EPA Method 8120(-----)	-----	N	13.21	EPA Method 8330(-----)	-----	N
13.11	EPA Method 8140(06-06-86)	-----	Y				
13.12	EPA Method 8150(06-06-86)	-----	Y				

14 Bulk Asbestos Analysis (-----)

14.1	1% or Greater Asbestos Concentrations (Title 22, CCR, 66261.24(a)(2)(A))	-----	N
------	--	-------	---

15 Substances Regulated Under the California Safe Drinking Water and Toxic Enforcement Act (Proposition 65) and Not Included in Other Listed Groups.

16 Wastewater Inorganic Chemistry, Nutrients and Demand (07-15-91)

16.1	Acidity	-----	Y	16.12	Cyanide	-----	Y
16.2	Alkalinity	-----	Y	16.13	Cyanide amenable to Chlorination	-----	Y
16.3	Ammonia	-----	Y	16.14	Fluoride	-----	Y
16.4	Biochemical Oxygen Demand	-----	Y	16.15	Hardness	-----	Y
16.5	Boron	-----	Y	16.16	Kjeldahl Nitrogen	-----	Y
16.6	Bromide	-----	Y	16.17	Magnesium	-----	Y
16.7	Calcium	-----	Y	16.18	Nitrate	-----	Y
16.8	CBOD	-----	N	16.19	Nitrite	-----	Y
16.9	Chemical Oxygen Demand	-----	Y	16.20	Oil and Grease	-----	Y
16.10	Chloride	-----	Y	16.21	Organic Carbon	-----	Y
16.11	Chlorine Residual, total	-----	Y	16.22	Oxygen, Dissolved	-----	Y

CERTIFICATE NUMBER: 1573  
 EXPIRATION DATE: 7/31/95

16.23	pH	Y	16.39	Surfactants (MBAS)	Y
16.24	Phenols	Y	16.40	Tannin and Lignin	Y
16.25	Phosphate, ortho-	Y	16.41	Turbidity	Y
16.26	Phosphorus, total	Y	16.42	Iron (Colorimetric Only)	N
16.27	Potassium	Y	16.43	Manganese (Colorimetric Only)	N
16.28	Residue, Total	Y	16.44	Total Recoverable	
16.29	Residue, Filterable (TDS)	Y		Petroleum Hydrocarbons	Y
16.30	Residue, Nonfilterable (TSS)	Y	16.45	Total Organic Halides	Y
16.31	Residue, Settleable (SS)	Y			
16.32	Residue, Volatile	Y			
16.33	Silica	Y			
16.34	Sodium	Y			
16.35	Specific Conductance	Y			
16.36	Sulfate	Y			
16.37	Sulfide (includes total & soluble)	Y			
16.38	Sulfite	Y			

17 Toxic Chemical Elements in Wastewater (07-15-91)

17.1	Aluminum	Y	17.18	Nickel	Y
17.2	Antimony	Y	17.19	Osmium	N
17.3	Arsenic	Y	17.20	Palladium	N
17.4	Barium	Y	17.21	Platinum	N
17.5	Beryllium	Y	17.22	Rhodium	N
17.6	Cadmium	Y	17.23	Ruthenium	N
17.7	Chromium (VI)	Y	17.24	Selenium	Y
17.8	Chromium, total	Y	17.25	Silver	Y
17.9	Cobalt	Y	17.26	Strontium	Y
17.10	Copper	Y	17.27	Thallium	Y
17.11	Gold	Y	17.28	Tin	Y
17.12	Iridium	N	17.29	Titanium	Y
17.13	Iron	Y	17.30	Vanadium	Y
17.14	Lead	Y	17.31	Zinc	Y
17.15	Manganese	Y	17.32	EPA Method 200.7	Y
17.16	Mercury	Y	17.33	EPA Method 200.8	Y
17.17	Molybdenum	Y	17.34	DCP	N
			17.35	Asbestos	N

18 Organic Chemistry of Wastewater (measurements by GC/MS combination (07-15-91)

18.1	EPA Method 624	Y
18.2	EPA Method 625	Y
18.3	EPA Method 1613	N
18.4	EPA Method 1625	N
18.5	EPA Method 613	N

19 Organic Chemistry of Wastewater (excluding measurements by GC/MS combination) (07-15-91)

19.1	EPA Method 601	N	19.8	EPA Method 608	Y
19.2	EPA Method 602	Y	19.9	EPA Method 609	N
19.3	EPA Method 603	N	19.10	EPA Method 610	Y
19.4	EPA Method 604	N	19.11	EPA Method 611	N
19.5	EPA Method 605	N	19.12	EPA Method 632	Y
19.6	EPA Method 606	N	19.13	EPA Method 619	N
19.7	EPA Method 607	N	19.99	EPA Method 615	Y

20 Inorganic Chemistry and Toxic Chemical Elements of Pesticide Residues in Food (-----)

20.1	Processed Foods by One of the Following Methods	
	Atomic Absorption Spectrophotometry	N
	Inductively Coupled Plasma Atomic Emission Spectrophotometry	N
	Inductively Coupled Plasma/Mass Spectrometry	N
	Colorimetry	N
20.2	Raw Commodities by One of the Following Methods	
	Atomic Absorption Spectrophotometry	N
	Inductively Coupled Plasma Atomic Emission Spectrophotometry	N
	Inductively Coupled Plasma/Mass Spectrometry	N
	Colorimetric	N
20.3	Dairy Products by One of the Following Methods	
	Atomic Absorption Spectrophotometry	N
	Inductively Coupled Plasma Atomic Emission Spectrophotometry	N
	Inductively Coupled Plasma/Mass Spectrometry	N
	Colorimetry	N

CERTIFICATE NUMBER: 1573  
EXPIRATION DATE: 7/31/95

20.4	Feed Products by One of the Following Methods	
	Atomic Absorption Spectrophotometry .....	N
	Inductively Coupled Plasma Atomic Emission Spectrophotometry .....	N
	Inductively Coupled Plasma/Mass Spectrometry .....	N
	Colorimetry .....	N
21	<u>Organic Chemistry of Pesticide Residues in Food (measurements by GC/MS) (-----)</u>	
21.1	Gas Chromatographic/Mass Spectrometric Methods in Processed Foods .....	N
21.2	Gas Chromatographic/Mass Spectrometric Methods in Raw Commodities .....	N
21.3	Gas Chromatographic/Mass Spectrometric Methods in Dairy Products .....	N
21.4	Gas Chromatographic/Mass Spectrometric Methods in Feed Products .....	N
22	<u>Organic Chemistry of Pesticide Residues in Food (Excluding Measurement by GC/MS Combination)</u> <u>(-----)</u>	
22.1	Halogenated Compounds in Processed Foods by One of the Following Methods	
	Gas Chromatography .....	N
	High Pressure Liquid Chromatography .....	N
	Liquid Chromatography/Mass Spectrometry .....	N
22.2	Organophosphorous Compounds in Processed Foods by One of the Following Methods	
	Gas Chromatography .....	N
	High Pressure Liquid Chromatography .....	N
	Liquid Chromatography/Mass Spectrometry .....	N
22.3	Carbamates in Processed Foods by One of the Following Methods	
	Gas Chromatography .....	N
	High Pressure Liquid Chromatography .....	N
	Liquid Chromatography/Mass Spectrometry .....	N
22.4	Halogenated Compounds in Raw Commodities by One of the Following Methods	
	Gas Chromatography .....	N
	High Pressure Liquid Chromatography .....	N
	Liquid Chromatography/Mass Spectrometry .....	N
22.5	Organophosphorous Compounds in Raw Commodities by One of the Following Methods	
	Gas Chromatography .....	N
	High Pressure Liquid Chromatography .....	N
	Liquid Chromatography/Mass Spectrometry .....	N
22.6	Carbamates in Raw Commodities by One of the Following Methods	
	Gas Chromatography .....	N
	High Pressure Liquid Chromatography .....	N
	Liquid Chromatography/Mass Spectrometry .....	N
22.7	Halogenated Compounds in Dairy Products by One of the Following Methods	
	Gas Chromatography .....	N
	High Pressure Liquid Chromatography .....	N
	Liquid Chromatography/Mass Spectrometry .....	N
22.8	Organophosphorous Compounds in Dairy Products by One of the Following Methods	
	Gas Chromatography .....	N
	High Pressure Liquid Chromatography .....	N
	Liquid Chromatography/Mass Spectrometry .....	N
22.9	Carbamates in Dairy Products by One of the Following Methods	
	Gas Chromatography .....	N
	High Pressure Liquid Chromatography .....	N
	Liquid Chromatography/Mass Spectrometry .....	N
22.10	Halogenated Compounds in Feed Products by One of the Following Methods	
	Gas Chromatography .....	N
	High Pressure Liquid Chromatography .....	N
	Liquid Chromatography/Mass Spectrometry .....	N
22.11	Organophosphorous Compounds in Feed Products by One of the Following Methods	
	Gas Chromatography .....	N
	High Pressure Liquid Chromatography .....	N
	Liquid Chromatography/Mass Spectrometry .....	N
22.12	Carbamates in Feed Products by One of the Following Methods	
	Gas Chromatography .....	N
	High Pressure Liquid Chromatography .....	N
	Liquid Chromatography/Mass Spectrometry .....	N

## **Performance and System Audits**

### **Figure 12-3 FGL Stockton - CA DHS ELAP Certification**

**This page intentionally left blank for figures on next 5 pages.**

**ENVIRONMENTAL LABORATORY ACCREDITATION/REGISTRATION**  
**List of Approved Fields of Testing and Analytes**

FGL Environmental  
 2500 Stagecoach Road  
 Stockton, CA

TELEPHONE No: (209) 942-0181  
 CALIFORNIA COUNTY: San Joaquin

CERTIFICATE NUMBER: 1563  
 EXPIRATION DATE: 07/31/95

<b>1 Microbiology of Drinking Water and Wastewater (07-03-91)</b>		
1.1	Total Coliforms in Drinking Water by Multiple Tube Fermentation	Y
1.2	Fecal Coliforms/E. Coli in Drinking Water by MTF	Y
1.3	Total Coliforms in Drinking Water by Membrane Filter Technics	N
1.4	Fecal Coliforms/E. Coli in Drinking Water by Membrane Filter Technics	N
1.5	Total Coliforms and E. Coli in Drinking Water by M40-MUG	Y
1.6	Total Coliforms in Drinking Water by Clark's Presence/Absence	Y
1.7	Fecal Coliforms/E. Coli in Drinking Water by Clark's Presence/Absence	Y
1.8	Heterotrophic Plate Count	Y
1.9	Total Coliforms in Wastewater by Multiple Tube Fermentation	Y
1.10	Fecal Coliforms in Wastewater by MTF	Y
1.11	Total Coliforms in Wastewater by Membrane Filter Technics	N
1.12	Fecal Coliforms in Wastewater by Membrane Filter Technics	N
1.13	Fecal Streptococci or Enterococci by Multiple Tube Technics	N
1.14	Fecal Streptococci or Enterococci by Membrane Filter Technics	N
<b>2 Inorganic Chemistry and Physical Properties of Drinking Water excluding Toxic Chemical Elements (07-03-91)</b>		
2.1	Alkalinity	Y
2.2	Calcium	Y
2.3	Chloride	Y
2.4	Corrosivity	Y
2.5	Fluoride	Y
2.6	Hardness	Y
2.7	Magnesium	Y
2.8	MBAS	Y
2.9	Nitrate	Y
2.10	Nitrite	Y
2.11	Sodium	Y
2.12	Sulfate	Y
2.13	Total Filterable Residue and Conductivity	Y
2.14	Iron (Colorimetric Methods Only)	N
2.15	Manganese (Colorimetric Methods Only)	N
2.16	Phosphate, ortho	Y
2.17	Silica (Colorimetric Methods Only)	Y
2.18	Cyanide	Y
<b>3 Analysis of Toxic Chemical Elements in Drinking Water (07-03-91)</b>		
3.1	Arsenic	Y
3.2	Barium	Y
3.3	Cadmium	Y
3.4	Chromium, total	Y
3.5	Copper	Y
3.6	Iron	Y
3.7	Lead	Y
3.8	Manganese	Y
3.9	Mercury	Y
3.10	Selenium	Y
3.11	Silver	Y
3.12	Zinc	Y
3.13	Aluminum	Y
3.14	Asbestos	N
3.15	EPA Method 200.7	Y
3.16	EPA Method 200.8 (Unregulated Elements and Lead Only)	N
3.17	Antimony	Y
3.18	Beryllium	Y
3.19	Nickel	Y
3.20	Thallium	Y
<b>4 Organic Chemistry of Drinking Water (measurement by GC/MS combination) (07-03-91)</b>		
4.1	EPA Method 501.3	Y
4.2	EPA Method 524.2	Y
4.3	EPA Method 525	Y
4.4	EPA Method 513	N
<b>5 Organic Chemistry of Drinking Water (excluding measurements by GC/MS combination) (07-03-91)</b>		
5.1	EPA Method 501.1	Y
5.2	EPA Method 501.2	Y
5.3	EPA Method 502.1	Y
5.4	EPA Method 502.2	Y
5.5	EPA Method 503.1	Y
5.6	EPA Method 504	Y
5.7	EPA Method 505	Y
5.8	EPA Method 506	N
5.9	EPA Method 507	N
5.10	EPA Method 508	Y
5.11	EPA Method 508A	N
5.12	EPA Method 510.1	Y
5.13	EPA Method 515.1	Y
5.14	EPA Method 531.1	N
5.15	EPA Method 547	N
5.16	EPA Method 543	N
5.17	EPA Method 549	N
5.18	EPA Method 550	N
5.19	EPA Method 550.1	N
5.20	EPA Method 551	N
5.21	EPA Method 552	Y



CERTIFICATE NUMBER: 1563  
EXPIRATION DATE: 07-31-95

6 Radiochemistry (-----)

6.1	Gross Alpha and Beta Radiation -----	N	6.11	Gross Alpha by Co-precipitation -----	N
6.2	Total Radium -----	N	6.12	Radium 228 -----	N
6.3	Radium 226 -----	N	6.13	Radioactive Iodine -----	N
6.4	Uranium -----	N	6.14	Gross Alpha & Beta in Hazardous Wastes --	N
6.5	Radon 222 -----	N	6.15	Alpha Emitting Radium Isotopes	
6.6	Radioactive Cesium -----	N		in Haz. Wastes -----	N
6.7	Iodine 131 -----	N	6.16	Radium 228 in Hazardous Wastes -----	N
6.8	Radioactive Strontium -----	N			
6.9	Tritium -----	N			
6.10	Gamma and Photon Emitters -----	N			

7 Shellfish Sanitation (-----)

7.1	Shellfish meat Microbiology -----	N
7.2	Paralytic Shellfish Poison -----	N
7.3	Domoic Acid -----	N

8 Aquatic Toxicity Bioassays (-----)

8.1	Hazardous Waste Aquatic Toxicity Bioassay (Title 22, CCR, 66261.24(a)(6)) -----	N
8.2	Wastewater Testing According to Kopperdahl (1976) using Freshwater Fish. -----	N
8.3	Wastewater Testing According to EPA/600/4-85/013 using Freshwater and/or Marine Organisms -----	N
8.4	Wastewater Testing by EPA Method 1000.0 -----	N
8.5	Wastewater Testing by EPA Method 1002.0 -----	N
8.6	Wastewater Testing by EPA Method 1003.0 -----	N
8.7	Wastewater Testing by EPA Method 1006 -----	N
8.8	Wastewater Testing by EPA Method 1007 -----	N
8.9	Wastewater Testing by EPA Method 1009 -----	N
8.10	Wastewater Testing According to Anderson, et. al. (1990) using Giant Kelp ( <i>Macrocystis pyrifera</i> ) --	N
8.11	Wastewater Testing According to Anderson, et. al. (1990) using Red Abalone ( <i>Haliotis rufescens</i> ) ---	N
8.12	Wastewater Testing According to Dinnel and Stober (1987) using Purple Sea Urchin ( <i>Strongylocentrotus purpuratus</i> ) -----	N
8.13	Wastewater Testing According to Dinnel and Stober (1987) using Red Sea Urchin ( <i>Strongylocentrotus franciscanus</i> ) -----	N
8.14	Wastewater Testing According to Dinnel and Stober (1987) using Sand Dollar ( <i>Dendraster excentricus</i> ) -----	N
8.15	Wastewater Testing According to procedure E 724-89 (ASTM, 1989) using Pacific Oyster ( <i>Crassostrea gigas</i> ) -----	N
8.16	Wastewater Testing According to procedure E 724-89 (ASTM, 1989) using California Bay Mussel ( <i>Mytilus edulis</i> ) -----	N
8.17	Wastewater Testing According to Standard Methods (APHA, 1989) using an alga ( <i>Skeletonema costatum</i> ) -----	N
8.18	Wastewater Testing According to EPA/600/4-90/027 using Freshwater and/or Marine Organisms -----	N

9 Physical Properties Testing of Hazardous Waste (11-09-93)

9.1	Ignitability by Flashpoint determination (Title 22, CCR, 66261.21) -----	N
9.2	Corrosivity - pH determination (Title 22, CCR, 66261.22) -----	Y
9.3	Corrosivity - Corrosivity towards steel (Title 22, CCR, 66261.22) -----	N
9.4	Reactivity (Title 22, CCR, 66261.23) -----	Y

10 Inorganic Chemistry and Toxic Chemical Elements of Hazardous Waste

10.1	Antimony 7040(07-03-91) -----	Y	10.7	Cobalt 7200(07-03-91) -----	Y
	7041(07-03-91) -----	Y		7201(07-03-91) -----	Y
10.2	Arsenic 7060(07-03-91) -----	Y	10.8	Copper 7210(07-03-91) -----	Y
	7061(-----) -----	N		7211(07-03-91) -----	Y
10.3	Barium 7080(07-03-91) -----	Y	10.9	Lead 7420(07-03-91) -----	Y
	7081(07-03-91) -----	Y		7421(07-03-91) -----	Y
10.4	Beryllium 7090(07-03-91) -----	Y	10.10	Mercury 7470(07-03-91) -----	Y
	7091(07-03-91) -----	Y		7471(07-03-91) -----	Y
10.5	Cadmium 7130(07-03-91) -----	Y	10.11	Molybdenum 7480(07-03-91) -----	Y
	7131(07-03-91) -----	Y		7481(07-03-91) -----	Y
10.6	Chromium, total 7190(07-03-91) -----	Y	10.12	Nickel 7520(07-03-91) -----	Y
	7191(07-03-91) -----	Y			

[illegible]

11.1	California Waste Extraction Test (WET) (Title 22, CCR, 66261.100, Appendix II)	Y
11.2	Extraction Procedure Toxicity	Y
11.3	Toxicity Characteristic Leaching Procedure (TCLP) All Classes	N
11.4	Toxicity Characteristic Leaching Procedure (TCLP) Inorganics Only	N
11.5	Toxicity Characteristic Leaching Procedure (TCLP) Extractables Only	N
11.6	Toxicity Characteristic Leaching Procedure (TCLP) Volatiles Only	N

12.1	EPA Method	8240(11-09-91)	-----	Y
12.2	EPA Method	8250(-----)	-----	N
12.3	EPA method	8270(07-03-91)	-----	Y
12.4	EPA Method	8280(-----)	-----	N
12.5	EPA Method	8290(-----)	-----	N
12.6	EPA Method	8260(11-09-93)	-----	Y

13.1	EPA Method 8010(07-03-91)	-----	Y	13.13	EPA Method 8310(-----)	-----	N
13.2	EPA Method 8015(07-03-91)	-----	Y	13.14	EPA Method 632 (-----)	-----	N
13.3	EPA Method 8020(07-03-91)	-----	Y	13.15	Total Petroleum Hydrocarbons		
13.4	EPA Method 8030(-----)	-----	N		(LUFT Manual) (07-31-93)	-----	Y
13.5	EPA Method 8040(07-03-91)	-----	Y	13.16	EPA Method 8011(11-09-93)	-----	Y
13.6	EPA Method 8060(-----)	-----	N	13.17	EPA Method 8021(-----)	-----	N
13.7	EPA Method 8080(07-03-91)	-----	Y	13.18	EPA Method 8070(-----)	-----	N
13.8	EPA Method 8090(-----)	-----	N	13.19	EPA Method 8110(-----)	-----	N
13.9	EPA Method 8100(-----)	-----	N	13.20	EPA Method 8141(-----)	-----	N
13.10	EPA Method 8120(-----)	-----	N	13.21	EPA Method 8330(-----)	-----	N
13.11	EPA Method 8140(-----)	-----	N				
13.12	EPA Method 8150(07-03-91)	-----	Y				

14.1 1% or Greater Asbestos Concentrations (Title 22, CCR, 66261.24(a)(2)(A)) -----N

## 16 Wastewater Inorganic Chemistry, Nutrients and Demand (07-03-91)

Page -3-

CERTIFICATE NUMBER: 1563  
EXPIRATION DATE: 07-31-95

16.23	pH	Y	16.39	Surfactants (MBAS)	Y
16.24	Phenols	Y	16.40	Tannin and Lignin	Y
16.25	Phosphate, ortho-	Y	16.41	Turbidity	Y
16.26	Phosphorus, total	Y	16.42	Iron (Colorimetric Only)	Y
16.27	Potassium	Y	16.43	Manganese (Colorimetric Only)	Y
16.28	Residue, Total	Y	16.44	Total Recoverable	
16.29	Residue, Filterable (TDS)	Y		Petroleum Hydrocarbons	Y
16.30	Residue, Nonfilterable (TSS)	Y	16.45	Total Organic Halides	N
16.31	Residue, Settleable (SS)	Y			
16.32	Residue, Volatile	Y			
16.33	Silica	Y			
16.34	Sodium	Y			
16.35	Specific Conductance	Y			
16.36	Sulfate	Y			
16.37	Sulfide (includes total & soluble)	Y			
16.38	Sulfite	Y			

17 Toxic Chemical Elements in Wastewater (07-03-91)

17.1	Aluminum	Y	17.18	Nickel	Y
17.2	Antimony	Y	17.19	Osmium	Y
17.3	Arsenic	Y	17.20	Palladium	N
17.4	Barium	Y	17.21	Platinum	N
17.5	Beryllium	Y	17.22	Rhodium	N
17.6	Cadmium	Y	17.23	Ruthenium	N
17.7	Chromium (VI)	Y	17.24	Selenium	Y
17.8	Chromium, total	Y	17.25	Silver	Y
17.9	Cobalt	Y	17.26	Strontium	Y
17.10	Copper	Y	17.27	Thallium	Y
17.11	Gold	Y	17.28	Tin	Y
17.12	Iridium	Y	17.29	Titanium	Y
17.13	Iron	Y	17.30	Vanadium	Y
17.14	Lead	Y	17.31	Zinc	Y
17.15	Manganese	Y	17.32	EPA Method 200.7	Y
17.16	Mercury	Y	17.33	EPA Method 200.8	N
17.17	Molybdenum	Y	17.34	DCP	N
			17.35	Asbestos	N

18 Organic Chemistry of Wastewater (measurements by GC/MS combination (07-03-91))

18.1	EPA Method 624	Y
18.2	EPA Method 625	Y
18.3	EPA Method 1613	N
18.4	EPA Method 1625	N
18.5	EPA Method 613	N

19 Organic Chemistry of Wastewater (excluding measurements by GC/MS combination) (07-03-91)

19.1	EPA Method 601	Y	19.8	EPA Method 608	Y
19.2	EPA Method 602	Y	19.9	EPA Method 609	N
19.3	EPA Method 603	Y	19.10	EPA Method 610	N
19.4	EPA Method 604	Y	19.11	EPA Method 611	N
19.5	EPA Method 605	N	19.12	EPA Method 632	N
19.6	EPA Method 606	N	19.13	EPA Method 619	N
19.7	EPA Method 607	N	19.99	EPA Method 615	Y

20 Inorganic Chemistry and Toxic Chemical Elements of Pesticide Residues in Food (-----)

20.1	Processed Foods by One of the Following Methods	
	Atomic Absorption Spectrophotometry	N
	Inductively Coupled Plasma Atomic Emission Spectrophotometry	N
	Inductively Coupled Plasma/Mass Spectrometry	N
	Colorimetry	N
20.2	Raw Commodities by One of the Following Methods	
	Atomic Absorption Spectrophotometry	N
	Inductively Coupled Plasma Atomic Emission Spectrophotometry	N
	Inductively Coupled Plasma/Mass Spectrometry	N
	Colorimetric	N
20.3	Dairy Products by One of the Following Methods	
	Atomic Absorption Spectrophotometry	N
	Inductively Coupled Plasma Atomic Emission Spectrophotometry	N
	Inductively Coupled Plasma/Mass Spectrometry	N
	Colorimetry	N

CERTIFICATE NUMBER: 1563  
EXPIRATION DATE: 07-31-95

20.4	Feed Products by One of the Following Methods	
	Atomic Absorption Spectrophotometry	N
	Inductively Coupled Plasma Atomic Emission Spectrophotometry	N
	Inductively Coupled Plasma/Mass Spectrometry	N
	Colorimetry	N
21	<u>Organic Chemistry of Pesticide Residues in Food (measurements by GC/MS) (-----)</u>	
21.1	Gas Chromatographic/Mass Spectrometric Methods in Processed Foods	N
21.2	Gas Chromatographic/Mass Spectrometric Methods in Raw Commodities	N
21.3	Gas Chromatographic/Mass Spectrometric Methods in Dairy Products	N
21.4	Gas Chromatographic/Mass Spectrometric Methods in Feed Products	N
22	<u>Organic Chemistry of Pesticide Residues in Food (Excluding Measurement by GC/MS Combination) (-----)</u>	
22.1	Halogenated Compounds in Processed Foods by One of the Following Methods	
	Gas Chromatography	N
	High Pressure Liquid Chromatography	N
	Liquid Chromatography/Mass Spectrometry	N
22.2	Organophosphorous Compounds in Processed Foods by One of the Following Methods	
	Gas Chromatography	N
	High Pressure Liquid Chromatography	N
	Liquid Chromatography/Mass Spectrometry	N
22.3	Carbamates in Processed Foods by One of the Following Methods	
	Gas Chromatography	N
	High Pressure Liquid Chromatography	N
	Liquid Chromatography/Mass Spectrometry	N
22.4	Halogenated Compounds in Raw Commodities by One of the Following Methods	
	Gas Chromatography	N
	High Pressure Liquid Chromatography	N
	Liquid Chromatography/Mass Spectrometry	N
22.5	Organophosphorous Compounds in Raw Commodities by One of the Following Methods	
	Gas Chromatography	N
	High Pressure Liquid Chromatography	N
	Liquid Chromatography/Mass Spectrometry	N
22.6	Carbamates in Raw Commodities by One of the Following Methods	
	Gas Chromatography	N
	High Pressure Liquid Chromatography	N
	Liquid Chromatography/Mass Spectrometry	N
22.7	Halogenated Compounds in Dairy Products by One of the Following Methods	
	Gas Chromatography	N
	High Pressure Liquid Chromatography	N
	Liquid Chromatography/Mass Spectrometry	N
22.8	Organophosphorous Compounds in Dairy Products by One of the Following Methods	
	Gas Chromatography	N
	High Pressure Liquid Chromatography	N
	Liquid Chromatography/Mass Spectrometry	N
22.9	Carbamates in Dairy Products by One of the Following Methods	
	Gas Chromatography	N
	High Pressure Liquid Chromatography	N
	Liquid Chromatography/Mass Spectrometry	N
22.10	Halogenated Compounds in Feed Products by One of the Following Methods	
	Gas Chromatography	N
	High Pressure Liquid Chromatography	N
	Liquid Chromatography/Mass Spectrometry	N
22.11	Organophosphorous Compounds in Feed Products by One of the Following Methods	
	Gas Chromatography	N
	High Pressure Liquid Chromatography	N
	Liquid Chromatography/Mass Spectrometry	N
22.12	Carbamates in Feed Products by One of the Following Methods	
	Gas Chromatography	N
	High Pressure Liquid Chromatography	N
	Liquid Chromatography/Mass Spectrometry	N

## **Performance and System Audits**

### **Figure 12-4 FGL Santa Paula - NV DHR Certification**

**This page intentionally left blank for figures on next 2 pages.**

L. H. DODGION  
Administrator

STATE OF NEVADA  
BOB MILLER  
Governor

PETER G. MORROS  
Director

Administration (702) 687-4670  
Air Quality 687-5065  
Mining Regulation and Reclamation 687-4675  
Water Quality Planning 687-5883  
Water Pollution Control 687-5870  
Fax 687-5856



Waste Management 687-5872  
Chemical Hazards Management 687-5872  
Federal Facilities 687-5872  
Fax 885-0868

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES  
DIVISION OF ENVIRONMENTAL PROTECTION

Capitol Complex  
333 W. Nye Lane  
Carson City, Nevada 89710

FGL ENVIRONMENTAL, INC. CA140  
853 CORPORATION STREET  
SANTA PAULA, CA 93061

CONTACT KURT WILKINSON  
PHONE (805) 659-0910

Pursuant to regulations adopted by the State Environmental Commission, the State of Nevada will accept data from this laboratory for the following contaminants under the Clean Water Act based performance evaluation sample results from the following studies:

WP030  
WP031

THIS CERTIFICATE IS EFFECTIVE THRU SEPTEMBER, 1994, OR UNTIL WP032 IS EVALUATED.

MINERAL	NUTRIENTS	METALS	DEMANDS	ORGANICS	MISCELLANEOUS
pH	* AMMONIA-N	ALUMINUM			CYANIDE
SPEC. COND.	NITRATE	ARSENIC	TOC	PCBs IN OIL	TSS (NFR)
	ORTHO-P	BERYLLIUM	* 5-DAY BOD	PESTICIDES	* OIL & GREASE
HARDNESS	KJELDAHL-N	CAESIUM		VOLATILE HALOCARBONS	
CALCIUM	TOTAL-P	COBALT		VOLATILE AROMATICS	
MAGNESIUM		CHROMIUM			
SODIUM		COPPER			
POTASSIUM		IRON			
		MERCURY			
CHLORIDE		MANGANESE			
FLUORIDE		NICKEL			
SULFATE		LEAD			
		SELENIUM			
		VANADIUM			
		ZINC			
		ANTIMONY			
		SILVER			
		THALLIUM			
		* MOLYBDENUM			
		STRONTIUM			

LAST ON-SITE

\* PROVISIONAL ACCEPTANCE

Recommended:

3-24-94  
Date

Approved:

3/25/94  
Date

Robert J. Vicks  
Chemistry Certification Officer

James J. Cooper  
Quality Assurance Officer

BOB MILLER  
Governor

SCOTT M. CRAIGIE  
Director



YVONNE SYLVA  
Administrator

DONALD S. KWALICK, MD, MPH  
State Health Officer

STATE OF NEVADA  
DEPARTMENT OF HUMAN RESOURCES  
HEALTH DIVISION  
BUREAU OF LABORATORY SERVICES

FGL ENVIRONMENTAL, INC. CA140  
853 CORPORATION STREET  
SANTA PAULA, CA 93061

CONTACT KURT WILKINSON  
PHONE (805) 659-0910

Pursuant to regulations adopted by the State Board of Health, the State of Nevada will accept data from this laboratory for the following contaminants under the Safe Drinking Water Act based performance evaluation sample results from EMSL-LV radiochemistry and the following studies:

WS032 WP030  
WS033 WP031

THIS CERTIFICATE IS EFFECTIVE THRU OCTOBER, 1994, OR UNTIL WP032 AND WS034 ARE EVALUATED.

INORGANICS		ORGANICS		RADIOCHEMISTRY
PRIMARY	SECONDARY	ALACHLOR	* TRIHALOMETHANES (THMs)	GROSS ALPHA
ANTIMONY		ATRAZINE		GROSS BETA
ARSENIC	pH	CHLORODANE	VOLATILE ORGANIC	RADIUM-226
BARIUM	SPEC. COND.	ENDRIN	COMPOUNDS (VOCs)	RADIUM-228
BERYLLIUM		HEPTACHLOR	INCLUDING	URANIUM
CADMIUM	HARDNESS	HEPTACHLOR EPOXIDE	VINYL CHLORIDE	
CHROMIUM	CALCIUM	HEXACHLOROBENZENE		
COPPER	MAGNESIUM	HEXACHLOROCYCLOPENTADIENE		
LEAD	SODIUM	LINDANE		
MERCURY	POTASSIUM	METHOXYCHLOR	ETHYLENE DIBROMIDE (EDB)	
NICKEL		SIMAZINE	DIBROMOCHLOROPROPANE (DB)	
SELENIUM	CHLORIDE	TOXAPHENE		
SILVER	SULFATE		DECACHLOROBIPHENYL	
THALLIUM	IRON	2,4-D		
NITRATE-N	MANGANESE	2,4,5-TP	BENZO (A) PYRENE	
NITRITE-N	ZINC	DALAPON	BIS (2-ETHYLHEXYL) ADIPATE	
FLUORIDE		DINOSEB	BIS (2-ETHYLHEXYL) PHTHALA	
		PENTACHLOROPHENOL *	DIQUAT	
		PICLORAM	ENDOTHALL	
RES CHLORINE			GLYPHOSATE	
TURBIDITY		* ALDICARB		
TOTAL CYANIDE		ALDICARB SULFONE		
		ALDICARB SULFOXIDE		
		CARBOFURAN		
		OXAMYL (VYDATE)		

\* PROVISIONAL ACCEPTANCE

*Robert J. Vicks*  
CHEMISTRY CERTIFICATION OFFICER

3-30-94  
DATE

*Lawrence W. Wilson*  
LABORATORY CERTIFICATION OFFICER

3-30-94  
DATE

PAID NSHL

FY 1994





## **Preventative Maintenance**

### **13.1 Maintenance and Repair of Instruments**

Routine maintenance of equipment is performed by the analyst when appropriate. The department supervisor must be notified immediately if any sign of serious malfunction occurs in any instrument so that he can decide if a qualified serviceman should be consulted. If warranted, instrument repair and calibration is performed by qualified service technicians (usually service representatives of the instrument manufacturer). A record containing the date, the nature of the problem, description of the repair, and the name of the technician is also kept.

### **13.2 Good Laboratory Practices**

Good laboratory practices are followed to prevent contamination of samples and standards. This includes the careful cleaning of glassware, and the use of disposable labware and containers when practical. Sample containers are monitored for contamination when received, according to lot number and proposed use.

The bacteriology water is monitored for suitability. Standard plate count, electrical conductivity and residual chlorine are checked monthly. Heavy metals (including lead, cadmium, chromium, copper, nickel and zinc) are checked annually.



## **Specific Routine Procedures used to assess Data Precision, Accuracy, and Completeness**

Before analytical data can be used, it is necessary to determine the suitability of the data for a given purpose. The characteristics used to determine data suitability are precision, accuracy, and completeness. FGL Environmental determines these characteristics by using specific procedures, which are detailed in the following sections.

### **14.1 Precision**

Precision is the measure of how closely replicate analyses agree. FGL Environmental uses Relative Percent Difference (RPD) to measure between duplicate analyses.

Precision is monitored for nearly all methods by RPD's plotted on control charts. The mean RPD  $\pm 2$  standard deviations are the warning limits, and the mean RPD  $\pm 3$  standard deviation are the control limits. To assess precision, FGL Environmental uses the following on a regular basis:

- (1) Duplicate samples
- (2) Duplicate Matrix Spikes
- (3) Control Charts

#### **14.1.1 Precision Calculation**

The RPD of duplicate samples is an absolute value from the following calculation:

$$\frac{(\text{First Sample Value} - \text{Second Sample Value}) \times 100}{(\text{First Sample Value} + \text{Second Sample Value}) / 2}$$

### **14.2 Accuracy**

Accuracy measures the deviation of the analytical value from the "true" or known value. The true value for field samples are never known, so accuracy measurements are made on the analysis of QC samples analyzed with field samples.

Accuracy is monitored for nearly all methods by percent recoveries plotted on control charts. The mean recovery  $\pm 2$  standard deviation are the warning limits, and the mean recovery  $\pm 3$  standard deviation are the control limits. To assess accuracy, FGL Environmental uses the following on a regular basis:

- (1) Laboratory Control Samples
- (2) Matrix Spikes
- (3) Matrix Spike Duplicates
- (4) Surrogate Spikes
- (5) Control Charts

#### **14.2.1 Accuracy Calculations**

Percent recoveries are calculated as follows (identical units would be used through each calculation):

Laboratory control sample percent recoveries:

$$\frac{\text{value found} \times 100}{\text{true value}}$$

## **Specific Routine Procedures used to assess Data Precision, Accuracy, and Completeness**

### **14.2.1 Accuracy Calculations continued**

**Spike percent recoveries:**

$$\frac{(\text{spiked sample result} - \text{sample result}) \times 100}{\text{spike amount added}}$$

### **14.3 Completeness**

Completeness is defined by QAMS-005/80 as - a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions.

By this definition the influence of the laboratory on completeness involves three areas: appropriate sample handling and storage, conformance to holding time requirements and data validity as measured by meeting acceptance criteria for the quality control parameters. At FGL we extend this one step further and also measure the complete final report package received by the client. By using non-conformance reports to the QA Director or Officer we record deficiencies in the final report being received by the client.

#### **14.3.1 Completeness Calculations**

Completeness is calculated as follows:

$$\frac{\text{number of report deficiencies for the year} \times 100}{\text{total number of reports for the year}}$$

## **Corrective Actions**

Corrective actions are necessary when trends of more than one out-of-control situations occur. Corrective action reports are used to document the corrections made. Corrective actions are not normally used in isolated out-of-control situations that have routine explanations as the data in these situations must be resolved before continuing and reporting analyses.

### **15.1 Corrective Action Reports**

Each work area has a corrective action report logbook. When corrective actions are necessary, a corrective action report form (figure 15-1) is filled out identifying the analyst, date, method, client and lab number (if applicable), QA batch number (if applicable) problems encountered, investigation and proposed corrective actions. After implementing the actions another entry is required to verify that the problem was solved. This process may need to be repeated in some situations. The reports are on record and will be included in a project data package if that is required by the project plan. An example of a corrective action report form is shown in figure 15-1.

## **Corrective Actions**

### **Figure 15-1 Corrective Action Report Form**

**This page intentionally left blank for figure on next page.**

## Corrective Actions

### Corrective Action Report Form

Method: \_\_\_\_\_

Problem Assigned To: \_\_\_\_\_

Problem encountered: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Cause of the problem: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Corrective action: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Closure of Investigation:

Performed by: \_\_\_\_\_ Date: \_\_\_\_\_

Verified by: \_\_\_\_\_ Date: \_\_\_\_\_





## **Quality Assurance Reports to Management**

In order to insure that the Quality Assurance program at the lab maintains a high profile, there are several mechanisms in place which insure the QA information is routinely conveyed to laboratory management. This includes a formal monthly QA inspection summary report, reports on internal and external PE samples and summary reports for external system audits.

### **16.1 Monthly QA Inspection Summary Reports**

The QA Director or Officer prepares a report to all managers on a monthly basis. This is a two section report containing the following details:

- (1) All uncompleted non-conformance items, the manager responsible for resolving the item, and date found.
- (2) All completed non-conformance items, the manager responsible and the date resolved.

This provides a historical record of progress in quality control and tracks non-conformance items that have not been resolved. This helps management prioritize on going non-conformance items.

### **16.2 Performance Evaluation Failure Reports**

Evaluations of any failures on external PE samples are outlined by department supervisors and prepared by the QA Director or Officer for certifying agencies. Copies are given to the department supervisors and Lab Director.

### **16.3 External System Audit Summary Reports**

After debriefing by the auditors a summary report is prepared by the QA Director or Officer for the supervisors and Lab Director. Rather than waiting for an audit report, this initiates corrective actions for any non-conformance items promptly.

## **Quality Assurance Reports to Management**

### **Figure 16-1 FGL QA Inspection Summary Report Form**

**This page intentionally left blank for figure on next page.**

### Current Non-conformance Items

Date FoundDate Comp.



## Equipment List

FGL is dedicated to having state-of-the-art equipment throughout the laboratory. The top quality equipment is essential to providing reliable data. Autosamplers are used when available and appropriate to increase throughput. The following is a list of equipment:

### Organics

#### 5 GCMS's -

- 1 HP 5890II/5972 with 7673A autosampler
- 1 HP 5890II/5972 with LSC3000/ALS2016 autosampler
- 1 HP 5890II/5971A with 7673A autosampler
- 1 HP 5890/5970 with 7673A autosampler
- 1 Finnigan XL 50 with LSC2000/ALS2032 autosampler

#### 9 GC's -

- 2 HP 5890 with ECD + ECD detectors and 7673A autosampler
- 1 HP 5890 with NPD + NPD detectors and 7673A autosampler
- 1 HP 5890 with NPD + FPD detectors and 7673A autosampler
- 1 HP 5890 with PID detector and LSC2000/ALS2016 autosampler
- 1 HP 5890 with FID detector and LSC2000/ALS2016 autosampler
- 1 HP 5890 with FID detector
- 1 HP 5890 with ELCD + ELCD detectors
- 1 Varian 3700 with ECD + ECD detectors
- 1 Varian 3700 with ECD + FPD + FID detectors

#### 2 HPLC's -

- 1 HP 1090 with UV and fluorescence detectors and postcolumn derivatization
- 1 Hitachi system with diode array and fluorescence detectors

#### 2 IR's -

- 1 Perkin-Elmer 700
- 1 Foxboro Miran 1FF

#### 1 TOX -

- 1 MCI TOX 10

#### 1 TOC -

- 1 ASTRO 2001

### Inorganics

#### 1 ICP/MS -

- Fisons PlasmaQuad 2

#### 2 ICP's -

- 1 ARL 3410 with model 101 autosampler
- 1 Thermo-Jarrell Ash Atomscan 25

#### 2 Graphite Furnaces with Zeeman-AA -

- 1 Perkin-Elmer 5100Z with AS-60 autosampler
- 1 Hitachi Z-8100

## Equipment List

### Inorganics continued

- 2 Flame AA's -
  - 2 Perkin-Elmer 5000
- 2 Microwave Digesters -
  - 2 CEM - MDS 2100 Microwave Digester
- 2 IC's -
  - 2 Dionex 300 - Ion Chromatograph and Spectraphysics AS3500 autosampler
- 3 Autoanalyzer's -
  - 3 Technicon AA2 autoanalyzer
- 3 UV/VIS Spectrophotometer's -
  - 1 Perkin-Elmer Lambda 3
  - 1 Beckman model 24
- 2 Nephelometers (turbidimeters) -
  - 2 Sequoia-Turner model 690

### Radioactivity

- 1 Gamma ray spectroscope -
  - 1 Princeton Gamma Tech
- 1 Liquid scintillation autoanalyzer -
  - 1 Packard 2500TR
- 7 Proportional counter's -
  - 5 NMC PCC11T Alpha counters
  - 2 Tennelec LB 1000 Alpha/Beta counters
  - 1 Tennelec LB 5100 Alpha/Beta counter with autosampler

### Microbiology

- 3 Incubators
- 3 Autoclaves

### Field Services

- 11 Field vehicles
- 8 Isco composite autosamplers

### LIMS capabilities

- 3 Microvax with PCSA pathworks fileserver and Dbase IV
- 80 DOS/OS2/Windows based computers



**Corporate Offices & Laboratory**

P.O. Box 272/853 Corporation Street  
Santa Paula, CA 93061-0272  
TEL: (805) 659-0910  
FAX: (805) 525-4172

**Office & Laboratory**

2500 Stapecoach Road  
Stockton, CA 95215  
TEL: (209) 942-0181  
FAX: (209) 942-0423

**Field Office**

Visalia, California  
TEL: (209) 734-9473  
Mobile: (209) 738-6273

## **APPENDIX F**

### **BLANK, DUPLICATE, AND SPIKE SAMPLE ANALYTICAL REPORTS**





# ENVIRONMENTAL

## Analytical Chemists

July 20, 1994

LAB No: SP 403653-2

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Organic Analysis  
Matrix: Monitoring Well

Sampling Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4  
Sample Description: MW5/C/23 - 1A  
Sampled by: Tim Bricker  
Container: Amber Glass TFE-Cap  
Preservatives: H2SO4 pH < 2

Sampled: June 22, 1994  
Received: June 22, 1994  
Extracted: N/A  
Analyzed: June 30, 1994  
QA/QC ID#: SP 94063000A

### TOTAL ORGANIC HALOGENS

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOX	9020	ug/L	5	ND	5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)  
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.  
\* = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.  
Organic Laboratory Manager

Darrell H. Nelson, B.S.  
Laboratory Director

KAD/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 20, 1994

LAB No: SP 403653-2

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Organic Analysis  
Matrix: Monitoring Well

Sampling Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4  
Sample Description: MW5/O/23 - 1A  
Sampled by: Tim Bricker  
Container: Glass TFE-Cap  
Preservatives:  
Sampled: June 22, 1994  
Received: June 22, 1994  
Extracted: N/A  
Analyzed: June 28, 1994  
QA/QC ID#: SP 94062800K


### EPA METHOD 601

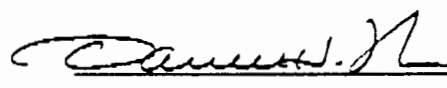
CONSTITUENT	SAMPLE	SAMPLE	LAB	BLANK
	DLR	RESULTS	DLR	RESULTS
	ug/L	ug/L	ug/L	ug/L
Trichloroethylene	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)  
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.  
\* = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

  
Kelly A. Dunnahoo, B.S.  
Organic Laboratory Manager

  
Darrell H. Nelson, B.S.  
Laboratory Director

KAD/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 15, 1994

LAB No: SP 403654-2

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Organic Analysis  
Matrix: Monitoring Well

Sampling Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4  
Sample Description: MW6/O/23 - 1A  
Sampled by: Tim Bricker  
Container: Glass TFE-Cap  
Preservatives:

Sampled: June 22, 1994  
Received: June 22, 1994  
Extracted: N/A  
Analyzed: June 28, 1994  
QA/QC ID#: SP 94062800K


### EPA METHOD 601

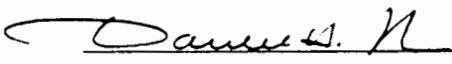
CONSTITUENT	SAMPLE	SAMPLE	LAB	BLANK
	DLR	RESULTS	DLR	RESULTS
	ug/L	ug/L	ug/L	ug/L
Trichloroethylene	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)  
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.  
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

  
Kelly A. Dunnahoo, B.S.  
Organic Laboratory Manager

  
Darrell H. Nelson, B.S.  
Laboratory Director

KAD/DHN:c1

## **APPENDIX G**

### **ANALYTICAL REPORTS FOR BACKGROUND WATER QUALITY PARAMETERS AND GROUND WATER MONITORING PARAMETERS**



# ENVIRONMENTAL

## Analytical Chemists

July 11, 1994

LAB No: SP 403651-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Inorganic Analysis

Sample Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4

Description: MW1/A,H,N,S/23

Sampled : June 22, 1994

Sampled by : Tim Bricker

Received : June 22, 1994

Type of Sample: Monitoring Well

Completed : June 29, 1994

QA/QC ID# : 40365101-

### Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS
Chloride	300.0	mg/L	2.0*	150
Conductivity	120.1	umhos/cm2	1	740
Fluoride	340.2	mg/L	0.1	0.2
Nitrate	353.2	mg/L	0.4	3.6
pH	150.1	units	---	7.5
Sulfate	300.0	mg/L	2.0*	15

DLR = Detection Limit for Reporting Purposes.

ND = Not Detected at or above the DLR.

ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram

\* = DLR adjusted because of dilutions, concentrations, or limited sample.

Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Kurt Wilkinson, B.S.  
Inorganic Lab Manager

Darrell H. Nelson, B.S.  
Laboratory Director

KW/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 15, 1994

LAB No: SP 403651-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Organic Analysis  
Matrix: Monitoring Well

Sampling Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4  
Sample Description: MW1/B/23  
Sampled by : Tim Bricker  
Container : Amber Glass TFE-Cap  
Preservatives: H2SO4 pH < 2

Sampled : June 22, 1994  
Received : June 22, 1994  
Extracted : N/A  
Analyzed : July 1, 1994  
QA/QC ID# : SP 94063000A

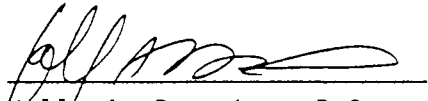
### TOTAL ORGANIC CARBON

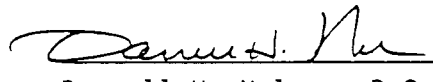
CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOC	415.1	mg/L	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)  
mg/L = Milligrams Per Liter (ppm) ND = Not Detected at or above the DLR.  
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

  
Kelly A. Dunnahoo, B.S.  
Organic Laboratory Manager

  
Darrell H. Nelson, B.S.  
Laboratory Director

KAD/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 15, 1994

LAB No: SP 403651-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Organic Analysis  
Matrix: Monitoring Well

Sampling Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4

Sample Description: MW1/C/23

Sampled : June 22, 1994

Sampled by : Tim Bricker

Received : June 22, 1994

Container : Amber Glass TFE-Cap

Extracted : N/A

Preservatives: H2SO4 pH < 2

Analyzed : June 30, 1994

QA/QC ID# : SP 94063000A

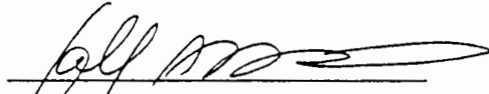
### TOTAL ORGANIC HALOGENS

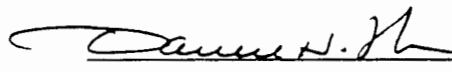
CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOX	9020	ug/L	5	ND	5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)  
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.  
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

  
Kelly A. Dunnahoo, B.S.  
Organic Laboratory Manager

  
Darrell H. Nelson, B.S.  
Laboratory Director

KAD/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

GENERAL MINERAL, PHYSICAL, INORGANIC, & RADIOLOGICAL CHEMICAL ANALYSES

Date of Report: July 12, 1994

Sample ID No. SP 403651-1

Laboratory

Signature Lab

Name: FGL Environmental

Director:

Name of Sampler: Tim Bricker

Employed By: Bermite

Date/time Sample

Date/Time

Sample

Date Analyses

Collected: 06/22/94-10:06

Rec. @ Lab:

06/22/94-13:26

Completed: 06/27/94

System

System

Name: Bermite Division of Whittaker

Number:

Name or Number of Sample Source: MW1/E/23

User ID:

Station Number:

Date/Time of Sample:

9 4 0 6 2 2 1 0 0 6

Laboratory Code: 5867

Y Y M M D D T T T T

Date Analyses Completed: 9 4 0 6 2 7

Y Y M M D D

Submitted by: FGL Environmental

Phone #: (805) 659-0910

## RADIOACTIVITY ANALYSIS

MCL	UNITS	CONSTITUENT	ENTRY	RESULT	DLR
5-35 !!	pCi/L	Gross Alpha	01501	2	
	pCi/L	Gross Alpha Counting Error	01502	± 2	
50	pCi/L	Gross Beta	03501	4	
	pCi/L	Gross Beta Counting Error	03502	± 2	

MCL - Maximum Contaminate Level

DLR - Detection Limit for Reporting purposes

ND - Not Detected at or above DLR

+ Indicates Secondary Drinking Water Standards

! >= 5 May require testing for  $U_{\alpha}$ ,  $^{226}Ra_{\alpha}$  >= 15 Unaccounted Alpha (Total  $\alpha$  -  $U_{\alpha}$ ) >= 35 Total Gross Alpha limit.



## Analytical Chemists

July 15, 1994

LAB No: SP 403651-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Organic Analysis  
Matrix: Monitoring Well

Sampling Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4  
Sample Description: MW1/O/23  
Sampled by : Tim Bricker  
Container : Glass TFE-Cap  
Preservatives:

Sampled : June 22, 1994  
Received : June 22, 1994  
Extracted : N/A  
Analyzed : June 28, 1994  
QA/QC ID# : SP 94062800K


### EPA METHOD 601

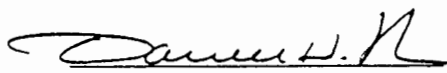
CONSTITUENT	SAMPLE DLR ug/L	SAMPLE RESULTS ug/L	LAB DLR ug/L	BLANK RESULTS ug/L
Trichloroethylene	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)  
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.  
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

  
Kelly A. Dunnahoo, B.S.  
Organic Laboratory Manager

  
Darrell H. Nelson, B.S.  
Laboratory Director

KAD/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 11, 1994

LAB No: SP 403651-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Inorganic Analysis

Sample Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4

Description: MW1/R,U/23

Sampled : June 22, 1994

Sampled by : Tim Bricker

Received : June 22, 1994

Type of Sample: Monitoring Well

Completed : June 23, 1994

QA/QC ID# : 40365101-

### Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS	MCL
Iron	200.7	ug/L	50	150	300
Lead	200.8	ug/L	0.2	ND	50
Manganese	200.7	ug/L	30	ND	50
Sodium	200.7	mg/L	1	54	

DLR = Detection Limit for Reporting Purposes.

ND = Not Detected at or above the DLR.

ug/L = Micrograms Per Liter (ppb)    mg/L = Milligrams Per Liter (ppm)    mg/kg = Milligrams Per Kilogram

♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

Preservatives: (1) Cool 4°C    Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Kurt Wilkinson, B.S.  
Inorganic Lab Manager

Darrell H. Nelson, B.S.  
Laboratory Director

KW/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 12, 1994

LAB No: SP 403651-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Inorganic Analysis

Sample Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4

Description: MW1/T/23

Sampled : June 22, 1994

Sampled by : Tim Bricker

Received : June 22, 1994

Type of Sample: Monitoring Well

Completed : June 23, 1994

QA/QC ID# : 40365101-

### Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS	MCL
Turbidity	180.1	NTU	0.2	1.0	5

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.  
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram  
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.  
Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Kurt Wilkinson, B.S.  
Inorganic Lab Manager

Darrell H. Nelson, B.S.  
Laboratory Director

KW/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 11, 1994

LAB No: SP 403652-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Inorganic Analysis

Sample Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4

Description: MW3/A,H,N,S/23

Sampled : June 22, 1994

Sampled by : Tim Bricker

Received : June 22, 1994

Type of Sample: Monitoring Well

Completed : June 29, 1994

QA/QC ID# : 40365201-

### Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS
Chloride	300.0	mg/L	2.0*	29
Conductivity	120.1	umhos/cm2	1	630
Fluoride	340.2	mg/L	0.1	0.2
Nitrate	353.2	mg/L	0.4	3.6
pH	150.1	units	---	7.6
Sulfate	300.0	mg/L	2.0*	71

DLR = Detection Limit for Reporting Purposes.

ND = Not Detected at or above the DLR.

ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram

\* = DLR adjusted because of dilutions, concentrations, or limited sample.

Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Kurt Wilkinson, B.S.  
Inorganic Lab Manager

Darrell H. Nelson, B.S.  
Laboratory Director

KW/DHN:c1



# FGL ENVIRONMENTAL

## Analytical Chemists

July 15, 1994

LAB No: SP 403652-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Organic Analysis  
Matrix: Monitoring Well

Sampling Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4  
Sample Description: MW3/B/23  
Sampled by : Tim Bricker  
Container : Amber Glass TFE-Cap  
Preservatives: H2SO4 pH < 2

Sampled : June 22, 1994  
Received : June 22, 1994  
Extracted : N/A  
Analyzed : June 30, 1994  
QA/QC ID# : SP 94063000A

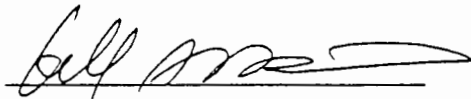
### TOTAL ORGANIC CARBON

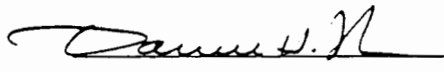
CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOC	415.1	mg/L	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)  
mg/L = Milligrams Per Liter (ppm) ND = Not Detected at or above the DLR.  
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

  
Kelly A. Dunnahoo, B.S.  
Organic Laboratory Manager

  
Darrell H. Nelson, B.S.  
Laboratory Director

KAD/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 15, 1994

LAB No: SP 403652-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Organic Analysis  
Matrix: Monitoring Well

Sampling Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4  
Sample Description: MW3/C/23  
Sampled by : Tim Bricker  
Container : Amber Glass TFE-Cap  
Preservatives: H2SO4 pH < 2

Sampled : June 22, 1994  
Received : June 22, 1994  
Extracted : N/A  
Analyzed : June 30, 1994  
QA/QC ID# : SP 94063000A


### TOTAL ORGANIC HALOGENS

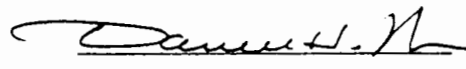
CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOX	9020	ug/L	5	8	5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)  
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.  
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

  
Kelly A. Dunnahoo, B.S.  
Organic Laboratory Manager

  
Darrell H. Nelson, B.S.  
Laboratory Director

KAD/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists GENERAL MINERAL, PHYSICAL, INORGANIC, & RADIOLOGICAL CHEMICAL ANALYSES

Date of Report: July 12, 1994

Laboratory

Name: FGL Environmental

Name of Sampler: Tim Bricker

Date/time Sample

Date/Time

Collected: 06/22/94-10:26

Rec. @ Lab:

Sample ID No. SP 403652-1

Signature Lab

Director:

Employed By: Bermite

Sample

Date Analyses

Completed: 06/27/94

System

Name: Bermite Division of Whittaker

System

Number:

Name or Number of Sample Source: MW3/E/23

User ID:

Station Number:

Date/Time of Sample: 9 4 0 6 2 2 1 0 2 6 Laboratory Code: 5867

Y Y M M D D T T T T

Date Analyses Completed: 9 4 0 6 2 7

Y Y M M D D

Submitted by: FGL Environmental

Phone #: (805) 659-0910

### RADIOACTIVITY ANALYSIS

MCL	UNITS	CONSTITUENT	ENTRY	RESULT	DLR
5-35 !!	pCi/L	Gross Alpha	01501	1.0	
	pCi/L	Gross Alpha Counting Error	01502	± 1	
50	pCi/L	Gross Beta	03501	3	
	pCi/L	Gross Beta Counting Error	03502	± 2	

MCL - Maximum Contaminate Level

DLR - Detection Limit for Reporting purposes

ND - Not Detected at or above DLR

+ Indicates Secondary Drinking Water Standards

! >= 5 May require testing for  $U_{\alpha}$ ,  $^{226}Ra_{\alpha}$  >= 15 Unaccounted Alpha {Total  $\alpha$  -  $U_{\alpha}$ } >= 35 Total Gross Alpha limit.



# ENVIRONMENTAL

## Analytical Chemists

July 15, 1994

LAB No: SP 403652-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Organic Analysis  
Matrix: Monitoring Well

Sampling Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4  
Sample Description: MW3/O/23  
Sampled by : Tim Bricker  
Container : Glass TFE-Cap  
Preservatives:

Sampled : June 22, 1994  
Received : June 22, 1994  
Extracted : N/A  
Analyzed : June 25, 1994  
QA/QC ID# : SP 94062500K

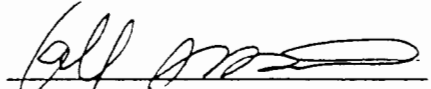
### EPA METHOD 601

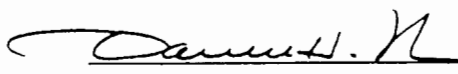
CONSTITUENT	SAMPLE	SAMPLE	LAB	BLANK
	DLR	RESULTS	DLR	RESULTS
	ug/L	ug/L	ug/L	ug/L
Trichloroethylene	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)  
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.  
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

  
Kelly A. Dunnahoo, B.S.  
Organic Laboratory Manager

  
Darrell H. Nelson, B.S.  
Laboratory Director

KAD/DHN:c1





# ENVIRONMENTAL

## Analytical Chemists

July 11, 1994

LAB No: SP 403652-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Inorganic Analysis

Sample Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4

Description: MW3/R,U/23

Sampled : June 22, 1994

Sampled by : Tim Bricker

Received : June 22, 1994

Type of Sample: Monitoring Well

Completed : June 23, 1994

QA/QC ID# : 40365201-

### Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS	MCL
Iron	200.7	ug/L	50	ND	300
Lead	200.8	ug/L	0.2	4.9	50
Manganese	200.7	ug/L	30	ND	50
Sodium	200.7	mg/L	1	53	

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.  
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram  
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.  
Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Kurt Wilkinson, B.S.  
Inorganic Lab Manager

Darrell H. Nelson, B.S.  
Laboratory Director

KW/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 12, 1994

LAB No: SP 403652-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Inorganic Analysis

Sample Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4

Description: MW3/T/23

Sampled : June 22, 1994

Sampled by : Tim Bricker

Received : June 22, 1994

Type of Sample: Monitoring Well

Completed : June 23, 1994

QA/QC ID# : 40365201-

### Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS	MCL
Turbidity	180.1	NTU	0.2	0.3	5

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.  
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram  
\* = DLR adjusted because of dilutions, concentrations, or limited sample.  
Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Kurt Wilkinson, B.S.  
Inorganic Lab Manager

Darrell H. Nelson, B.S.  
Laboratory Director

KW/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 11, 1994

LAB No: SP 403653-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Inorganic Analysis

Sample Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4

Description: MW5/A,H,N,S/23

Sampled : June 22, 1994

Sampled by : Tim Bricker

Received : June 22, 1994

Type of Sample: Monitoring Well

Completed : June 29, 1994

QA/QC ID# : 40365301-

### Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS
Chloride	300.0	mg/L	2.0*	40
Conductivity	120.1	umhos/cm2	1	540
Fluoride	340.2	mg/L	0.1	0.2
Nitrate	353.2	mg/L	0.4	3.6
pH	150.1	units	---	7.7
Sulfate	300.0	mg/L	2.0*	35

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.  
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram  
\* = DLR adjusted because of dilutions, concentrations, or limited sample.  
Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Kurt Wilkinson, B.S.  
Inorganic Lab Manager

Darrell H. Nelson, B.S.  
Laboratory Director

KW/DHN:c1



## Analytical Chemists

July 15, 1994

LAB No: SP 403653-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Organic Analysis  
Matrix: Monitoring Well

Sampling Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4  
Sample Description: MW5/B/23  
Sampled by : Tim Bricker  
Container : Amber Glass TFE-Cap  
Preservatives: H2SO4 pH < 2

Sampled : June 22, 1994  
Received : June 22, 1994  
Extracted : N/A  
Analyzed : July 1, 1994  
QA/QC ID# : SP 94063000A

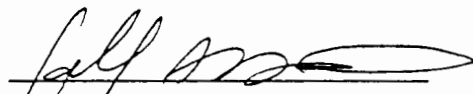
### TOTAL ORGANIC CARBON

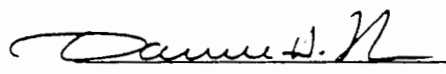
CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOC	415.1	mg/L	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)  
mg/L = Milligrams Per Liter (ppm) ND = Not Detected at or above the DLR.  
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

  
Kelly A. Dunnahoo, B.S.  
Organic Laboratory Manager

  
Darrell H. Nelson, B.S.  
Laboratory Director

KAD/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 15, 1994

LAB No: SP 403653-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Organic Analysis  
Matrix: Monitoring Well

Sampling Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4  
Sample Description: MW5/C/23  
Sampled by : Tim Bricker  
Container : Amber Glass TFE-Cap  
Preservatives: H2SO4 pH < 2

Sampled : June 22, 1994  
Received : June 22, 1994  
Extracted : N/A  
Analyzed : June 30, 1994  
QA/QC ID# : SP 94063000A

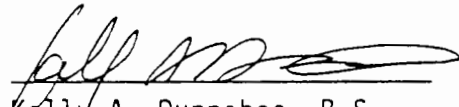
### TOTAL ORGANIC HALOGENS

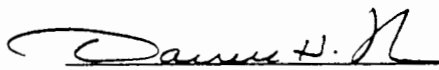
CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOX	9020	ug/L	5	ND	5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)  
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.  
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

  
Kelly A. Dunnahoo, B.S.  
Organic Laboratory Manager

  
Darrell H. Nelson, B.S.  
Laboratory Director

KAD/DHN:c1



# ENVIRONMENTAL

Analytical Chemists  
GENERAL MINERAL, PHYSICAL, INORGANIC, & RADIOLOGICAL CHEMICAL ANALYSES

Date of Report: July 12, 1994

Sample ID No. SP 403653-1

Laboratory

Signature Lab

Name: FGL Environmental

Director:

Name of Sampler: Tim Bricker

Employed By: Bermite

Date/time Sample

Date/Time

Sample

Date Analyses

Collected: 06/22/94-10:50

Rec. @ Lab:

06/22/94-13:26

Completed: 06/27/94

System

System

Name: Bermite Division of Whittaker

Number:

Name or Number of Sample Source: MW5/E/23

User ID:

Station Number:

Date/Time of Sample: 9 4 0 6 2 2 1 0 5 0 Laboratory Code: 5867

Y Y M M D D T T T T

Date Analyses Completed: 9 4 0 6 2 7

Y Y M M D D

Submitted by: FGL Environmental

Phone #: (805) 659-0910

## RADIOACTIVITY ANALYSIS

MCL	UNITS	CONSTITUENT	ENTRY	RESULT	DLR
5-35 !!	pCi/L	Gross Alpha	01501	1.0	
	pCi/L	Gross Alpha Counting Error	01502	± 1	
50	pCi/L	Gross Beta	03501	3	
	pCi/L	Gross Beta Counting Error	03502	± 2	

MCL - Maximum Contaminate Level

DLR - Detection Limit for Reporting purposes

ND - Not Detected at or above DLR

+ Indicates Secondary Drinking Water Standards

! >= 5 May require testing for  $U_{\alpha}$ ,  $^{226}Ra_{\alpha}$  >= 15 Unaccounted Alpha {Total  $\alpha$  -  $U_{\alpha}$ } >= 35 Total Gross Alpha limit.



# ENVIRONMENTAL

## Analytical Chemists

July 15, 1994

LAB No: SP 403653-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Organic Analysis  
Matrix: Monitoring Well

Sampling Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4  
Sample Description: MW5/O/23  
Sampled by : Tim Bricker  
Container : Glass TFE-Cap  
Preservatives:

Sampled : June 22, 1994  
Received : June 22, 1994  
Extracted : N/A  
Analyzed : June 28, 1994  
QA/QC ID# : SP 94062800K

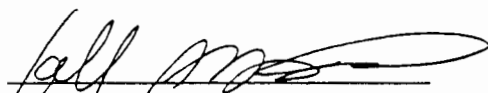
### EPA METHOD 601

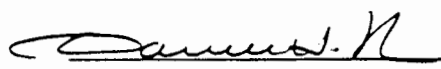
CONSTITUENT	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
	ug/L	ug/L	ug/L	ug/L
Trichloroethylene	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)  
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.  
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

  
Kelly A. Dunnahoo, B.S.  
Organic Laboratory Manager

  
Darrell H. Nelson, B.S.  
Laboratory Director

KAD/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 11, 1994

LAB No: SP 403653-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Inorganic Analysis

Sample Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4

Description: MW5/R,U/23

Sampled : June 22, 1994

Sampled by : Tim Bricker

Received : June 22, 1994

Type of Sample: Monitoring Well

Completed : June 23, 1994

QA/QC ID# : 40365301-

### Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS	MCL
Iron	200.7	ug/L	50	70	300
Lead	200.8	ug/L	0.2	ND	50
Manganese	200.7	ug/L	30	ND	50
Sodium	200.7	mg/L	1	54	

DLR = Detection Limit for Reporting Purposes.

ND = Not Detected at or above the DLR.

ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram

\* = DLR adjusted because of dilutions, concentrations, or limited sample.

Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Kurt Wilkinson, B.S.  
Inorganic Lab Manager

Darrell H. Nelson, B.S.  
Laboratory Director

KW/DHN:c1





# FGL ENVIRONMENTAL

## Analytical Chemists

July 12, 1994

LAB No: SP 403653-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Inorganic Analysis

Sample Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4

Description: MW5/T/23

Sampled : June 22, 1994

Sampled by : Tim Bricker

Received : June 22, 1994

Type of Sample: Monitoring Well

Completed : June 23, 1994

QA/QC ID# : 40365301-

### Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS	MCL
Turbidity	180.1	NTU	0.2	0.9	5

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.  
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram  
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.  
Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Kurt Wilkinson, B.S.  
Inorganic Lab Manager

Darrell H. Nelson, B.S.  
Laboratory Director

KW/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 11, 1994

LAB No: SP 403654-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Inorganic Analysis

Sample Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4  
Description: MW6/A,H,N,S/23  
Sampled by: Tim Bricker  
Type of Sample: Monitoring Well

Sampled : June 22, 1994  
Received : June 22, 1994  
Completed : June 29, 1994  
QA/QC ID# : 40365401-


### Analytical Results

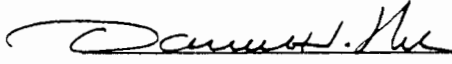
CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS
Chloride	300.0	mg/L	2.0*	65
Conductivity	120.1	umhos/cm2	1	550
Fluoride	340.2	mg/L	0.1	0.2
Nitrate	353.2	mg/L	0.4	3.8
pH	150.1	units	---	7.7
Sulfate	300.0	mg/L	2.0*	30

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.  
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram  
\* = DLR adjusted because of dilutions, concentrations, or limited sample.  
Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

  
Kurt Wilkinson, B.S.  
Inorganic Lab Manager

  
Darrell H. Nelson, B.S.  
Laboratory Director

KW/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 15, 1994

LAB No: SP 403654-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Organic Analysis  
Matrix: Monitoring Well

Sampling Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4  
Sample Description: MW6/B/23  
Sampled by : Tim Bricker  
Container : Amber Glass TFE-Cap  
Preservatives: H2SO4 pH < 2

Sampled : June 22, 1994  
Received : June 22, 1994  
Extracted : N/A  
Analyzed : July 1, 1994  
QA/QC ID# : SP 94063000A

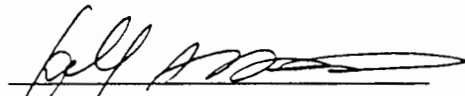
### TOTAL ORGANIC CARBON

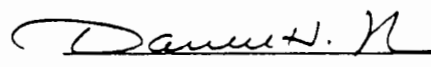
CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOC	415.1	mg/L	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)  
mg/L = Milligrams Per Liter (ppm) ND = Not Detected at or above the DLR.  
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

  
Kelly A. Dunnahoo, B.S.  
Organic Laboratory Manager

  
Darrell H. Nelson, B.S.  
Laboratory Director

KAD/DHN:c1

**ENVIRONMENTAL****Analytical Chemists**

August 1, 1994

LAB No: SP 403654-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Organic Analysis  
Matrix: Monitoring Well

Sampling Site: Bermite 317 Area 23rd Qtr. Water Sampling 85 01.4  
Sample Description: MW6/C/23  
Sampled by: Tim Bricker  
Container: Amber Glass TFE-Cap  
Preservatives: H2SO4 pH < 2

Sampled: June 22, 1994  
Received: June 22, 1994  
Extracted: N/A  
Analyzed: June 30, 1994  
QA/QC ID#: SP 94063000A

**TOTAL ORGANIC HALOGENS**

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOX	9020	ug/L	5	ND	5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)  
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.  
\* = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.  
Organic Laboratory Manager

Darrell H. Nelson, B.S.  
Laboratory Director

KAD/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

GENERAL MINERAL, PHYSICAL, INORGANIC, & RADIOLOGICAL CHEMICAL ANALYSES

Date of Report: July 12, 1994

Sample ID No. SP 403654-1

Laboratory

Signature Lab

Name: FGL Environmental

Director:

Name of Sampler: Tim Bricker

Employed By: Bermite

Date/time Sample

Date/Time

Sample

Date Analyses

Collected: 06/22/94-11:16

Rec. @ Lab:

06/22/94-13:26

Completed: 06/27/94

System

System

Name: Bermite Division of Whittaker

Number:

Name or Number of Sample Source: MW6/E/23

User ID:

Station Number:

Date/Time of Sample:

9 4 0 6 2 2 1 1 1 6  
Y Y M M D D T T T T

Laboratory Code: 5867

Date Analyses Completed: 9 4 0 6 2 7  
Y Y M M D D

Submitted by: FGL Environmental

Phone #: (805) 659-0910

## RADIOACTIVITY ANALYSIS

MCL	UNITS	CONSTITUENT	ENTRY	RESULT	DLR
5-35 !!	pCi/L	Gross Alpha	01501	0.1	
	pCi/L	Gross Alpha Counting Error	01502	± 1	
50	pCi/L	Gross Beta	03501	2	
	pCi/L	Gross Beta Counting Error	03502	± 2	

MCL - Maximum Contaminate Level

DLR - Detection Limit for Reporting purposes

ND - Not Detected at or above DLR

+ Indicates Secondary Drinking Water Standards

! >= 5 May require testing for  $U_{\alpha}$ ,  $^{226}Ra_{\alpha}$  >= 15 Unaccounted Alpha (Total  $\alpha$  -  $U_{\alpha}$ ) >= 35 Total Gross Alpha limit.



# ENVIRONMENTAL

## Analytical Chemists

July 15, 1994

LAB No: SP 403654-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Organic Analysis  
Matrix: Monitoring Well

Sampling Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4  
Sample Description: MW6/O/23  
Sampled by: Tim Bricker  
Container: Glass TFE-Cap  
Preservatives:

Sampled: June 22, 1994  
Received: June 22, 1994  
Extracted: N/A  
Analyzed: June 28, 1994  
QA/QC ID#: SP 94062800K

### EPA METHOD 601

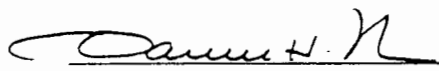
CONSTITUENT	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
	ug/L	ug/L	ug/L	ug/L
Trichloroethylene	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)  
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.  
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

  
Kelly A. Dunnahoo, B.S.  
Organic Laboratory Manager

  
Darrell H. Nelson, B.S.  
Laboratory Director

KAD/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 11, 1994

LAB No: SP 403654-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Inorganic Analysis

Sample Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4  
Description: MW6/R,U/23  
Sampled by: Tim Bricker  
Type of Sample: Monitoring Well

Sampled : June 22, 1994  
Received : June 22, 1994  
Completed : June 23, 1994  
QA/QC ID# : 40365401-

### Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS	MCL
Iron	200.7	ug/L	50	70	300
Lead	200.8	ug/L	0.2	ND	50
Manganese	200.7	ug/L	30	ND	50
Sodium	200.7	mg/L	1	58	

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.  
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram  
\* = DLR adjusted because of dilutions, concentrations, or limited sample.  
Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Kurt Wilkinson, B.S.  
Inorganic Lab Manager

Darrell H. Nelson, B.S.  
Laboratory Director

KW/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 12, 1994

LAB No: SP 403654-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Inorganic Analysis

Sample Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4

Description: MW6/T/23

Sampled : June 22, 1994

Sampled by : Tim Bricker

Received : June 22, 1994

Type of Sample: Monitoring Well

Completed : June 23, 1994

QA/QC ID# : 40365401-

### Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS	MCL
Turbidity	180.1	NTU	0.2	0.8	5

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.  
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram  
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.  
Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Kurt Wilkinson, B.S.  
Inorganic Lab Manager

Darrell H. Nelson, B.S.  
Laboratory Director

KW/DHN:c1





# ENVIRONMENTAL

## Analytical Chemists

July 11, 1994

LAB No: SP 403655-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Inorganic Analysis

Sample Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4

Description: MW10/A,H,N,S/23

Sampled : June 22, 1994

Sampled by : Tim Bricker

Received : June 22, 1994

Type of Sample: Monitoring Well

Completed : June 29, 1994

QA/QC ID# : 40365501-

### Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS
Chloride	300.0	mg/L	2.0*	64
Conductivity	120.1	umhos/cm2	1	610
Fluoride	340.2	mg/L	0.1	0.2
Nitrate	353.2	mg/L	0.4	3.7
pH	150.1	units	---	7.8
Sulfate	300.0	mg/L	2.0*	39

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.  
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram  
\* = DLR adjusted because of dilutions, concentrations, or limited sample.  
Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Kurt Wilkinson, B.S.  
Inorganic Lab Manager

Darrell H. Nelson, B.S.  
Laboratory Director

KW/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 15, 1994

LAB No: SP 403655-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Organic Analysis  
Matrix: Monitoring Well

Sampling Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4  
Sample Description: MW10/B/23  
Sampled by : Tim Bricker  
Container : Amber Glass TFE-Cap  
Preservatives: H2SO4 pH < 2

Sampled : June 22, 1994  
Received : June 22, 1994  
Extracted : N/A  
Analyzed : July 1, 1994  
QA/QC ID# : SP 94063000A

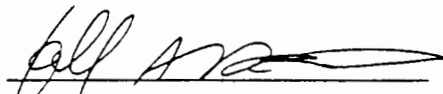
### TOTAL ORGANIC CARBON

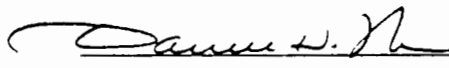
CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOC	415.1	mg/L	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)  
mg/L = Milligrams Per Liter (ppm) ND = Not Detected at or above the DLR.  
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

  
Kelly A. Dunnahoo, B.S.  
Organic Laboratory Manager

  
Darrell H. Nelson, B.S.  
Laboratory Director

KAD/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 15, 1994

LAB No: SP 403655-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Organic Analysis  
Matrix: Monitoring Well

Sampling Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4  
Sample Description: MW10/C/23  
Sampled by : Tim Bricker  
Container : Amber Glass TFE-Cap  
Preservatives: H2SO4 pH < 2

Sampled : June 22, 1994  
Received : June 22, 1994  
Extracted : N/A  
Analyzed : June 30, 1994  
QA/QC ID# : SP 94063000A

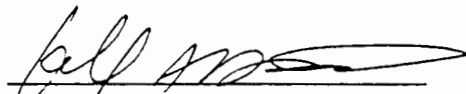
### TOTAL ORGANIC HALOGENS

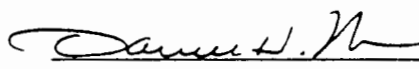
CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOX	9020	ug/L	5	20	5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)  
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.  
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

  
Kelly A. Dunnahoo, B.S.  
Organic Laboratory Manager

  
Darrell H. Nelson, B.S.  
Laboratory Director

KAD/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

GENERAL MINERAL, PHYSICAL, INORGANIC, & RADIOLOGICAL CHEMICAL ANALYSES

Date of Report: July 12, 1994

Laboratory

Name: FGL Environmental

Name of Sampler: Tim Bricker

Date/time Sample

Date/Time

Signature Lab

Director:

Employed By: Bermite

Collected: 06/22/94-11:41

Rec. @ Lab: 06/22/94-13:26

Completed: 06/27/94

Sample ID No. SP 403655-1

System

Name: Bermite Division of Whittaker

System

Number:

Name or Number of Sample Source: MW10/E/23

User ID:

Station Number:

Date/Time of Sample: 9 4 0 6 2 2 1 1 4 1 Laboratory Code: 5867

Y Y M M D D T T T T

Date Analyses Completed: 9 4 0 6 2 7

Y Y M M D D

Submitted by: FGL Environmental

Phone #: (805) 659-0910

## RADIOACTIVITY ANALYSIS

MCL	UNITS	CONSTITUENT	ENTRY	RESULT	DLR
5-35 !!	pCi/L	Gross Alpha	01501	0.4	
	pCi/L	Gross Alpha Counting Error	01502	± 1	
50	pCi/L	Gross Beta	03501	4	
	pCi/L	Gross Beta Counting Error	03502	± 2	

MCL - Maximum Contaminate Level

DLR - Detection Limit for Reporting purposes

ND - Not Detected at or above DLR

+ Indicates Secondary Drinking Water Standards

! >= 5 May require testing for  $U_{\alpha}$ ,  $^{226}Ra_{\alpha}$  >= 15 Unaccounted Alpha {Total  $\alpha$  -  $U_{\alpha}$ } >= 35 Total Gross Alpha limit.



# ENVIRONMENTAL

## Analytical Chemists

July 15, 1994

LAB No: SP 403655-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Organic Analysis  
Matrix: Monitoring Well

Sampling Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4  
Sample Description: MW10/0/23  
Sampled by : Tim Bricker  
Container : Glass TFE-Cap  
Preservatives:  
Sampled : June 22, 1994  
Received : June 22, 1994  
Extracted : N/A  
Analyzed : June 28, 1994  
QA/QC ID# : SP 94062800K


### EPA METHOD 601

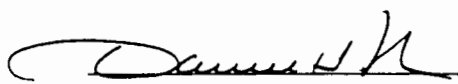
CONSTITUENT	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
	ug/L	ug/L	ug/L	ug/L
Trichloroethylene	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)  
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.  
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

  
Kelly A. Dunnahoo, B.S.  
Organic Laboratory Manager

  
Darrell H. Nelson, B.S.  
Laboratory Director

KAD/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 11, 1994

LAB No: SP 403655-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Inorganic Analysis

Sample Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4  
Description: MW10/R,U/23  
Sampled by : Tim Bricker  
Type of Sample: Monitoring Well

Sampled : June 22, 1994  
Received : June 22, 1994  
Completed : June 23, 1994  
QA/QC ID# : 40365501-

### Analytical Results

CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS	MCL
Iron	200.7	ug/L	50	ND	300
Lead	200.8	ug/L	0.2	ND	50
Manganese	200.7	ug/L	30	ND	50
Sodium	200.7	mg/L	1	86	

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.  
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram  
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.  
Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Kurt Wilkinson, B.S.  
Inorganic Lab Manager

Darrell H. Nelson, B.S.  
Laboratory Director

KW/DHN:c1



# ENVIRONMENTAL

## Analytical Chemists

July 12, 1994

LAB No: SP 403655-1

Bermite Division of Whittaker  
22116 W. Soledad Canyon Road  
Saugus, CA 91350

RE: Inorganic Analysis

Sample Site: Bermite 317 Area 23rd Qtr. Water Sampling - 85-01.4

Description: MW10/T/23

Sampled : June 22, 1994

Sampled by : Tim Bricker

Received : June 22, 1994

Type of Sample: Monitoring Well

Completed : June 23, 1994

QA/QC ID# : 40365501-


### Analytical Results

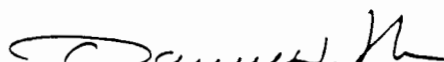
CONSTITUENT	EPA METHOD	UNITS	DLR	RESULTS	MCL
Turbidity	180.1	NTU	0.2	0.8	5

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.  
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram  
• = DLR adjusted because of dilutions, concentrations, or limited sample.  
Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

  
Kurt Wilkinson, B.S.  
Inorganic Lab Manager

  
Darrell H. Nelson, B.S.  
Laboratory Director

KW/DHN:c1

#### Corporate Offices & Laboratory

PO Box 272 / 853 Corporation Street  
Santa Paula, CA 93061-0272  
PH: 805/652-0010

#### Office & Laboratory

2500 Stagecoach Road  
Stockton, CA 95215  
PH: 209/942-0181

#### Field Office

Visalia, CA  
PH: 209/734-9473  
FAX: 209/734-8435

**APPENDIX H**  
**STATISTICAL ANALYSES**



TABLE H-1

## TWENTY-THIRD QUARTER SAMPLING EVENT

Parameter	Units	Tolerance Limit	Well No.		
			MW-5	MW-6	MW-10
Chloride	mg/l	175	40	65	64
pH		7.03/8.00	7.7	7.7	7.8
Specific Conductance	$\mu\text{mhos}/\text{cm}^2$	752	540	550	610
Sulfate	mg/l	105	35	30	39
Iron	$\mu\text{g}/\text{l}$	303	70	70	< 50
Manganese	$\mu\text{g}/\text{l}$	30 <sup>a</sup>	< 30	30	< 30
Sodium	mg/l	60.5	54	58	86
TCE	$\mu\text{g}/\text{l}$	0.5 <sup>a</sup>	< 0.5	< 0.5	< 0.5
TOC	mg/l	3.59	< 0.5	< 0.5	< 0.5
TOX	$\mu\text{g}/\text{l}$	65.4	< 5	< 5	20

Note: All tolerance limits are upper limits except pH which has both upper and lower limits.

<sup>a</sup>Tolerance limit set at detection limit.

TABLE H-2

CONCENTRATIONS OF GROUND WATER MONITORING PARAMETERS  
IN SAMPLES FROM BACKGROUND MONITORING WELL MW-1

Date	Quarter	pH <sup>a</sup>	Conductance <sup>a</sup> ( $\mu$ mhos/cm <sup>2</sup> )	TOC <sup>a</sup> (mg/l)	TOX <sup>a</sup> ( $\mu$ g/l)	SO <sub>4</sub> <sup>2-</sup> (mg/l)	Cl <sup>-</sup> (mg/l)	Fe ( $\mu$ g/l)	Mn ( $\mu$ g/l)	Na (mg/l)	TCE ( $\mu$ g/l)
10/04/88 <sup>b</sup>	1	7.5	598	<3	<100	11					<5
01/25/89	2	7.48	572	2.4 <sup>c</sup>	<100	22					
04/17/89	3	7.2		<3	<100	11					
07/27/89	4	7.48	500	2.4 <sup>c</sup>	<100	13					
10/31/89	5	7.6	524	<3	<100	10	83				
01/25/90	6	7.4	570	<3	<100	16	85				
04/17/90	7	7.55	504	<4	<20	11	88				
07/17/90	8	8.28	530	<4	<20	10	82				
10/18/90	9	7.4	544	<1	75 <sup>c</sup>	23	98				
01/29/91	10	7.5	573	1.4	<5	8	96				
04/23/91	11	7.68	559	1.8	<5	10	100				
07/19/91	12	7.33	575	1.2	<5	11	97				
10/08/91 <sup>d</sup>	--	--	--	--	--	--	--				
03/13/92	14	7.5	639	0.4 <sup>c</sup>	<5	13	131				
04/21/92	15	7.5	643	<0.5	<5	9	130				
07/29/92	16	7.55	660	<0.5	6.9	11	133				
10/20/92	17	7.5	676	<0.5	<5	10	138				
01/27/93	18	7.68	707	<0.5	<5	6	137				
06/09/93 <sup>e</sup>	19	7.5	715	<0.5	<5	9	134	250	<30	52	
07/14/93	20	--	--	--	--	--	--	220	<30	46	
08/11/93	20	--	--	--	--	--	--	60	<30	54	
09/22/93	20	7.5	720	<0.5	9	13	161	100	<30	52	
12/08/93	21	7.4	726	<0.5	<5	10	151	50	<30	57	
03/10/94	22	7.5	730	>0.5	<5	10	150	200	<30	48	<0.5
06/22/94	23	7.5	740	<0.5	<5	15	150	150	<30	54	<0.5

<sup>a</sup>Each value is the average result from four replicate samples.

<sup>b</sup>Samples from 01/27/88, 07/29/88, 08/15/88, and 10/04/88 reported TCE at <5  $\mu$ g/l.

<sup>c</sup>The replicates included a portion with results below the detection limit. The average was calculated after assigning a value of one-half the detection limit for the samples below the detection limit.

<sup>d</sup>Not sampled because water elevation dropped below elevation of sampling pump intake.

<sup>e</sup>Single sample. Replicates no longer taken.

TABLE H-3

CONCENTRATIONS OF GROUND WATER MONITORING PARAMETERS  
IN SAMPLES FROM BACKGROUND MONITORING WELL MW-3

Date	Quarter	pH <sup>a</sup>	Conductance <sup>a</sup> (μmhos/cm <sup>2</sup> )	TOC <sup>a</sup> (mg/l)	TOX <sup>a</sup> (μg/l)	SO <sub>4</sub> <sup>2-</sup> (mg/l)	Cl <sup>-</sup> (mg/l)	Fe (μg/l)	Mn (μg/l)	Na (mg/l)	TCE (μg/l)
10/04/88 <sup>b</sup>	1	7.48	699	<3	361.25	73					<5
01/25/89	2	7.73	664	<3	<100	74					
04/17/89	3	7.3		<3	<100	9					
07/27/89	4	7.5	661	<3	<100	65					
10/31/89	5	7.53	617	<3	<100	68	35				
01/25/90	6	7.18	641	7.1 <sup>c</sup>	<100	74	36				
04/17/90	7	7.33	590	<4	<20	60	46				
07/17/90	8	8.23	589	<4	<20	67	39				
10/18/90	9	7.63	642	0.7 <sup>c</sup>	<100	15	34				
01/29/91	10	7.28	656	2.2	<5	80	54				
04/23/91	11	7.55	629	2.0	<5	77	34				
07/19/91	12	7.23	633	1.3	<5	85	45				
10/09/91	13	7.65	642	<0.5	<5	34	37				
03/13/92	14	7.45	648	0.6	3.3 <sup>c</sup>	85	33				
04/21/92	15	7.5	644	<0.5	<5	81	37				
07/29/92	16	7.55	643	0.34 <sup>c</sup>	<5	74	33				
10/20/92	17	7.55	641	<0.5	<5	67	34				
01/27/93	18	7.6	640	<0.5	<5	69	30				
06/09/93 <sup>d</sup>	19	7.6	627	<0.5	<5	70	28	50	<30	48	
07/14/93	20	--	--	--	--	--	--	<50	<30	44	
08/11/93	20	--	--	--	--	--	--	<50	<30	50	
09/22/93	20	7.4	630	<0.5	<5	87	37	<50	<30	50	
12/08/93	21	7.4	627	<0.5	<5	72	35	<50	<30	54	
03/10/94	22	7.4	620	<0.5	<5	74	31	<50	<30	47	<0.5
06/22/94	23	7.6	630	<0.5	8 <sup>e</sup>	71	29	<50	<30	53	<0.5

<sup>a</sup>Each value is the average result from four replicate samples.

<sup>b</sup>Samples from 02/17/88, 05/27/88, 07/19/88, 08/15/88, and 10/04/88 reported TCE at <5 μg/l.

<sup>c</sup>The replicates included a portion with results below the detection limit. The average was calculated after assigning a value of one-half the detection limit for the samples below the detection limit.

<sup>d</sup>Single sample. Replicates no longer taken.

<sup>e</sup>Duplicate sample analytical result also 8 μg/l.

TABLE H-4  
TOLERANCE LIMIT CALCULATIONS

	pH	Conductance	TOC	TOX	Chloride	Sulfate	Iron	Manganese	Sodium
$\Sigma x$	338.2	27,018	50.34	799.7	2,831	1,793	1,230	210	709
n (number of samples)	45	43	45	44	37	45	14	14	14
$\bar{x}$ (mean)	7.51	628	1.12	18.2	76.5	39.8	87.9	15.0	50.7
s (sample standard deviation)	0.20	58.8	1.18	22.5	45.6	31.2	82.1	0	3.75
k (from tables)	2.408	2.105	2.092	2.099	2.150	2.092	2.614	2.614	2.614
Upper Tolerance Limit <sup>a</sup>	8.00	752	3.59	65.4	175	105	303	30 <sup>c</sup>	60.5
Lower Tolerance Limit <sup>b</sup>	7.03								

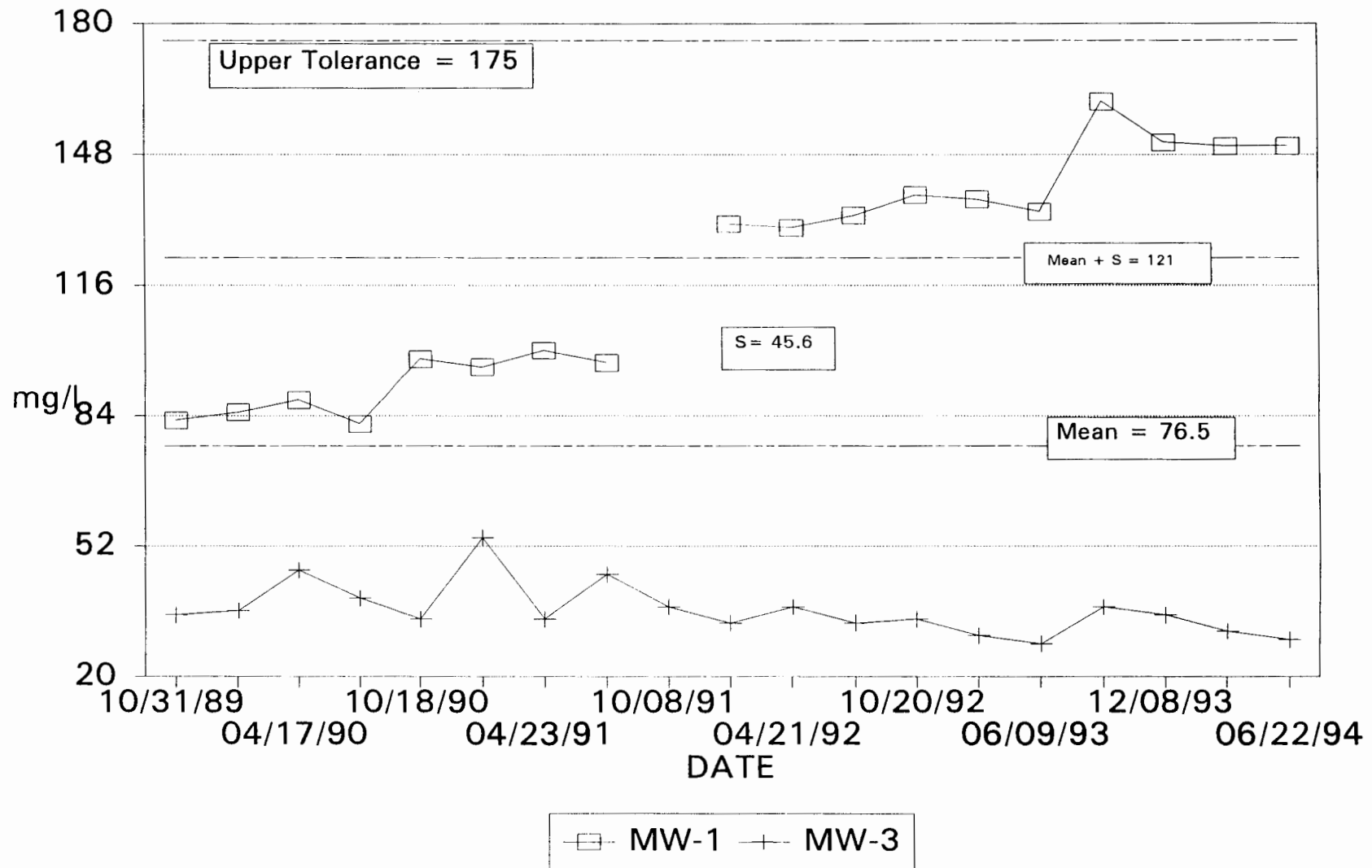
<sup>a</sup>Upper Tolerance Limit =  $\bar{x} + ks$ .

<sup>b</sup>Lower Tolerance Limit =  $\bar{x} - ks$ .

<sup>c</sup>Upper Tolerance Limit set at detection limit.

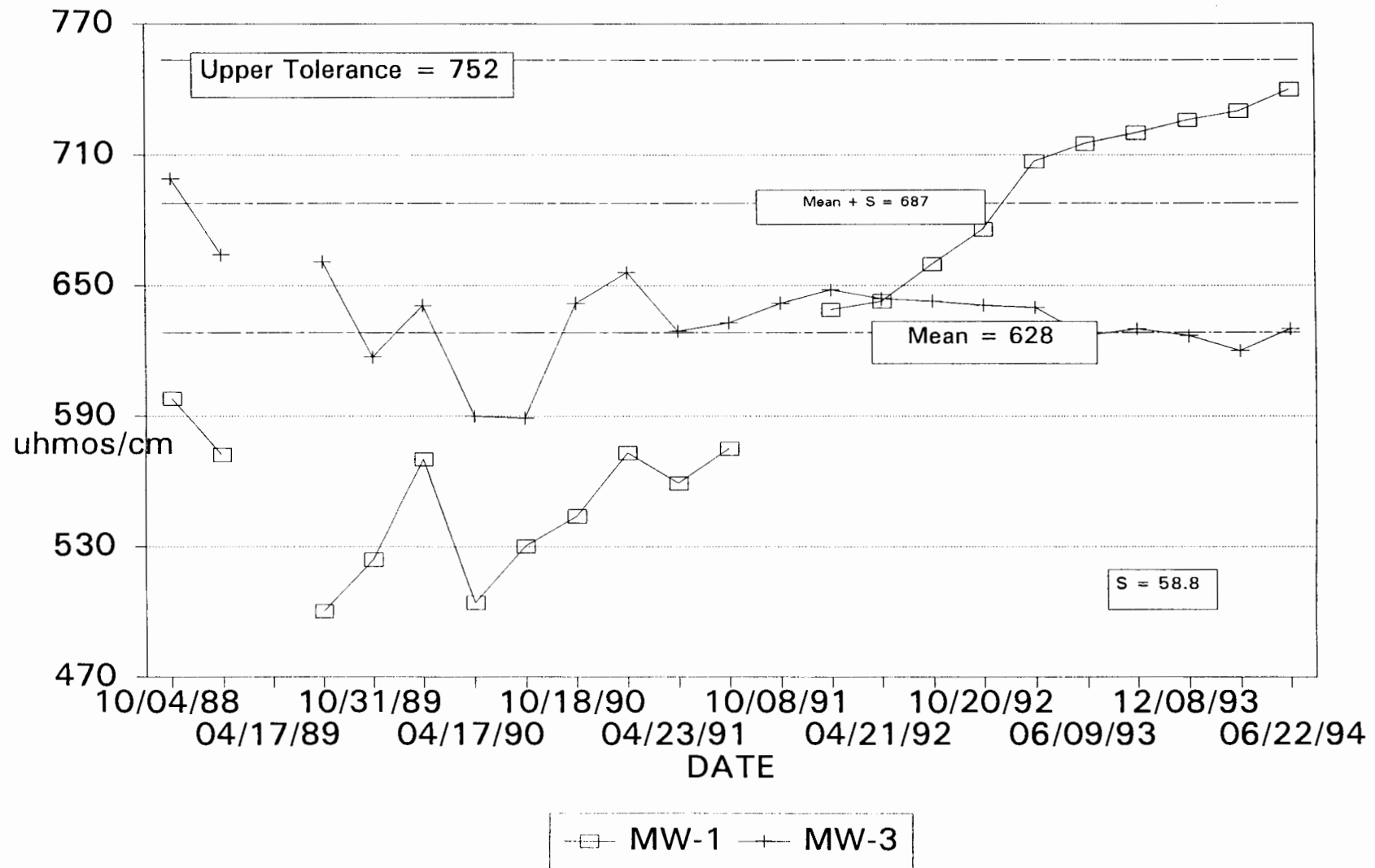
# CHLORIDE

## MONITORING WELLS MW-1 AND MW-3



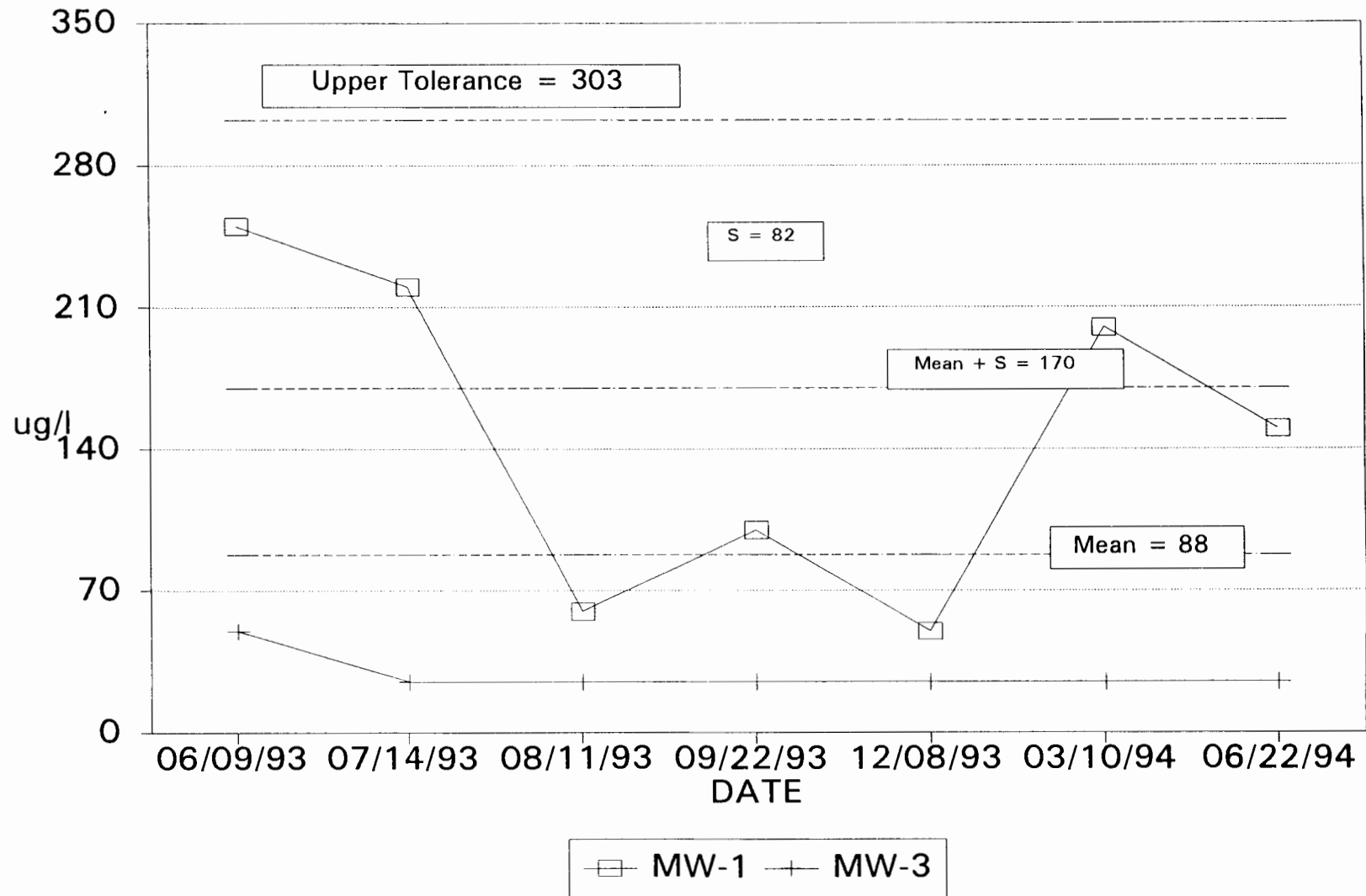
# SPECIFIC CONDUCTANCE

## MONITORING WELLS MW-1 AND MW-3



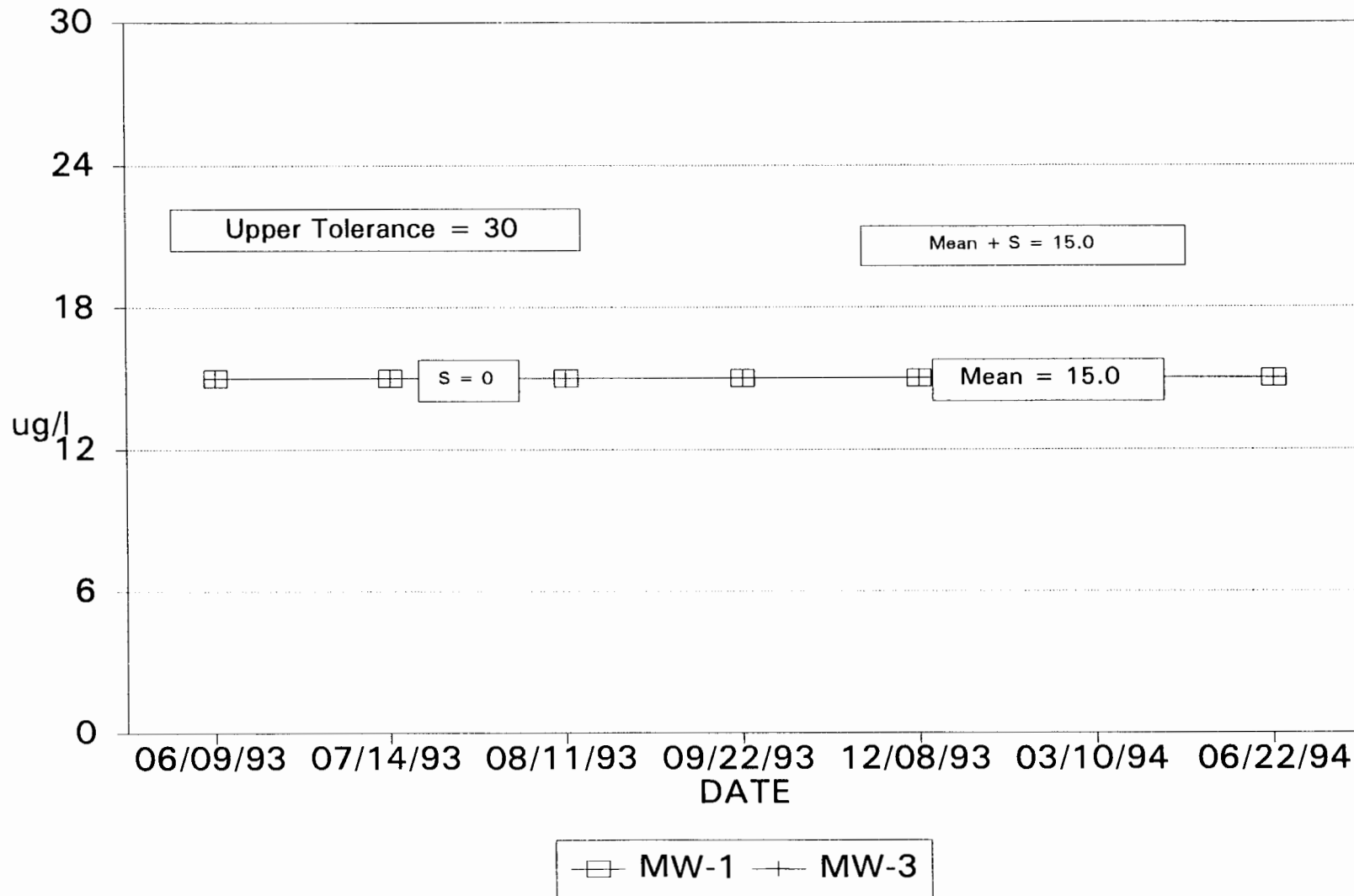
# IRON

## MONITORING WELLS MW-1 AND MW-3



# MANGANESE

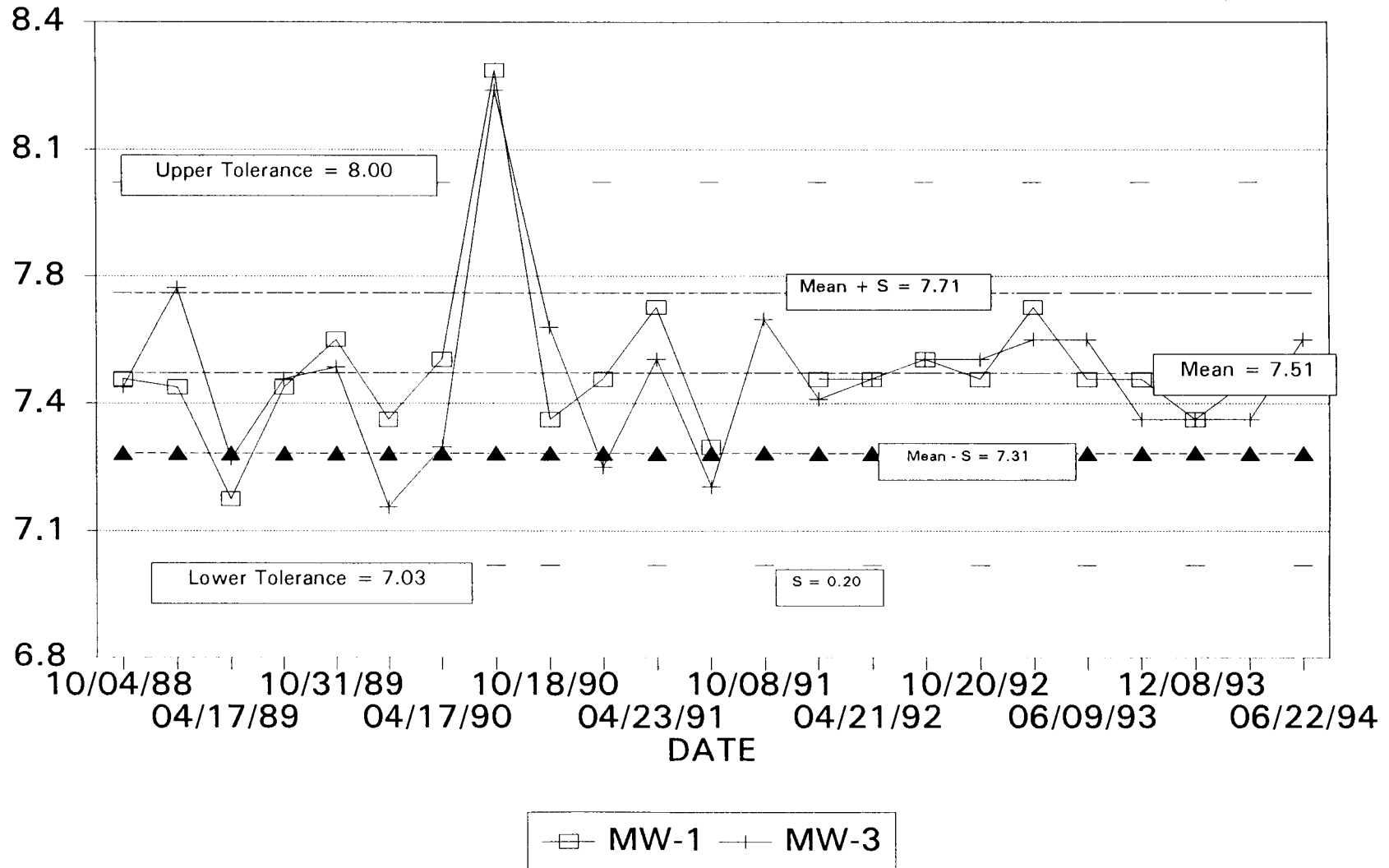
## MONITORING WELLS MW-1 AND MW-3





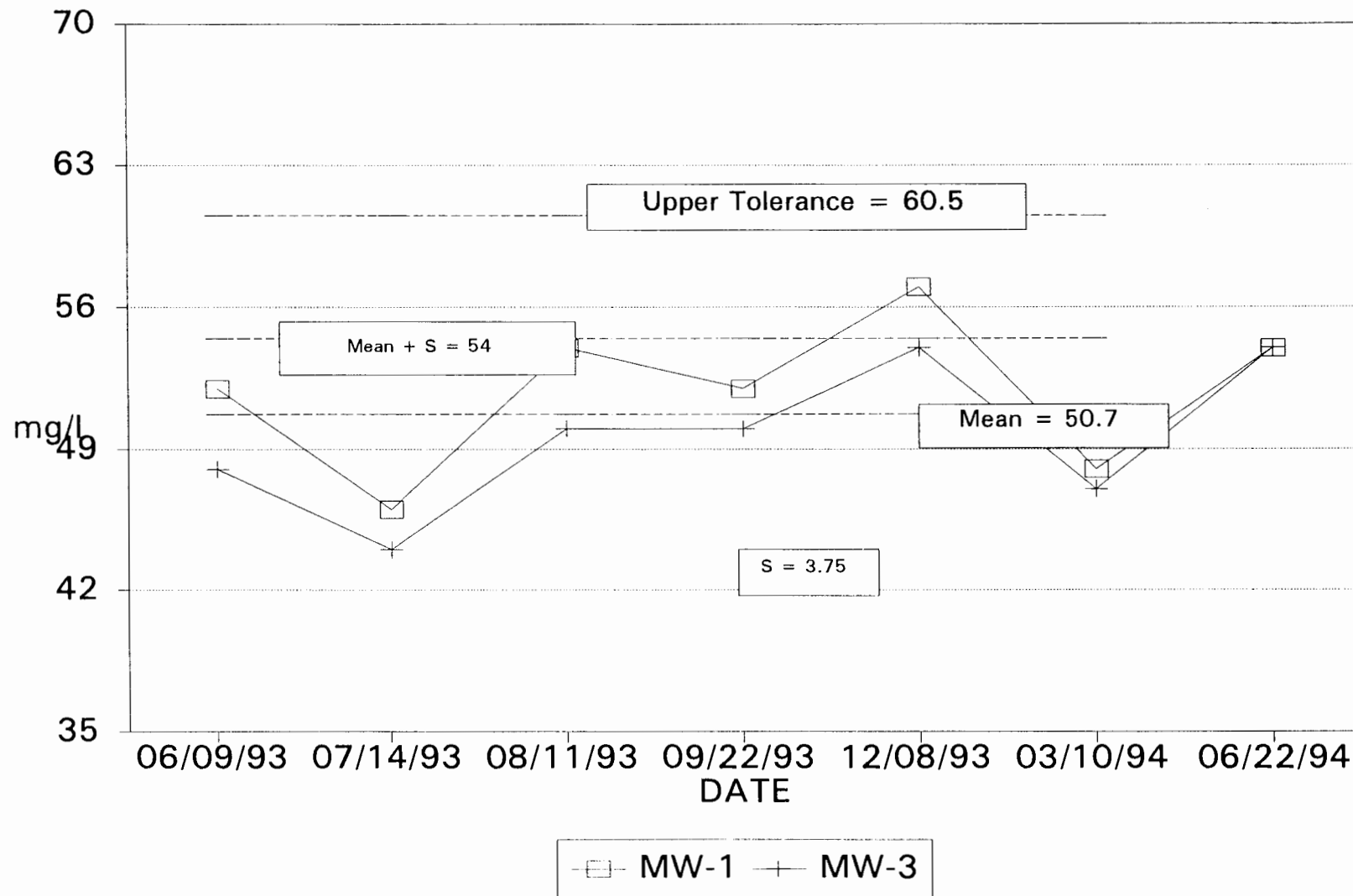
# pH

## MONITORING WELLS MW-1 AND MW-3



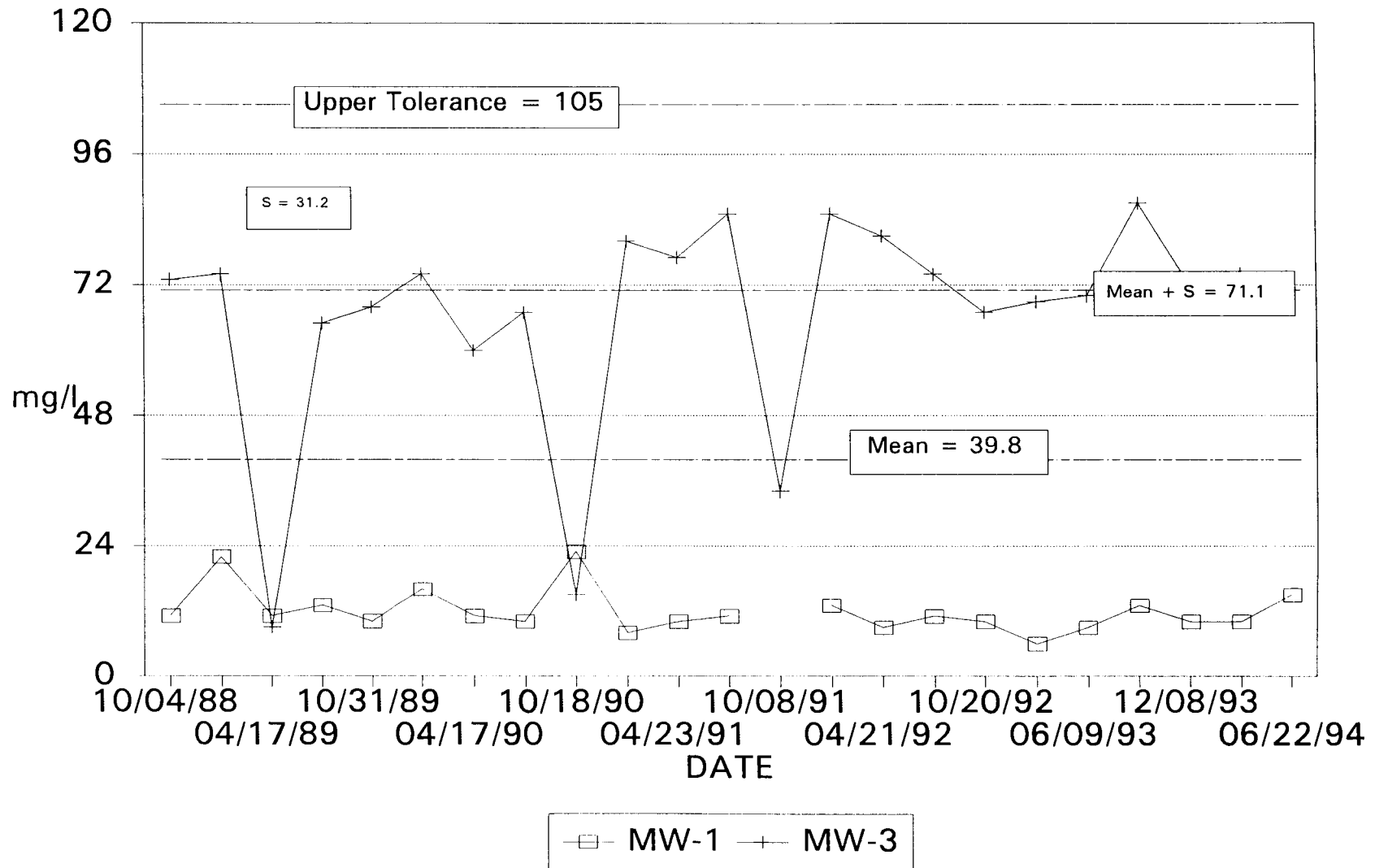
# SODIUM

## MONITORING WELLS MW-1 AND MW-3



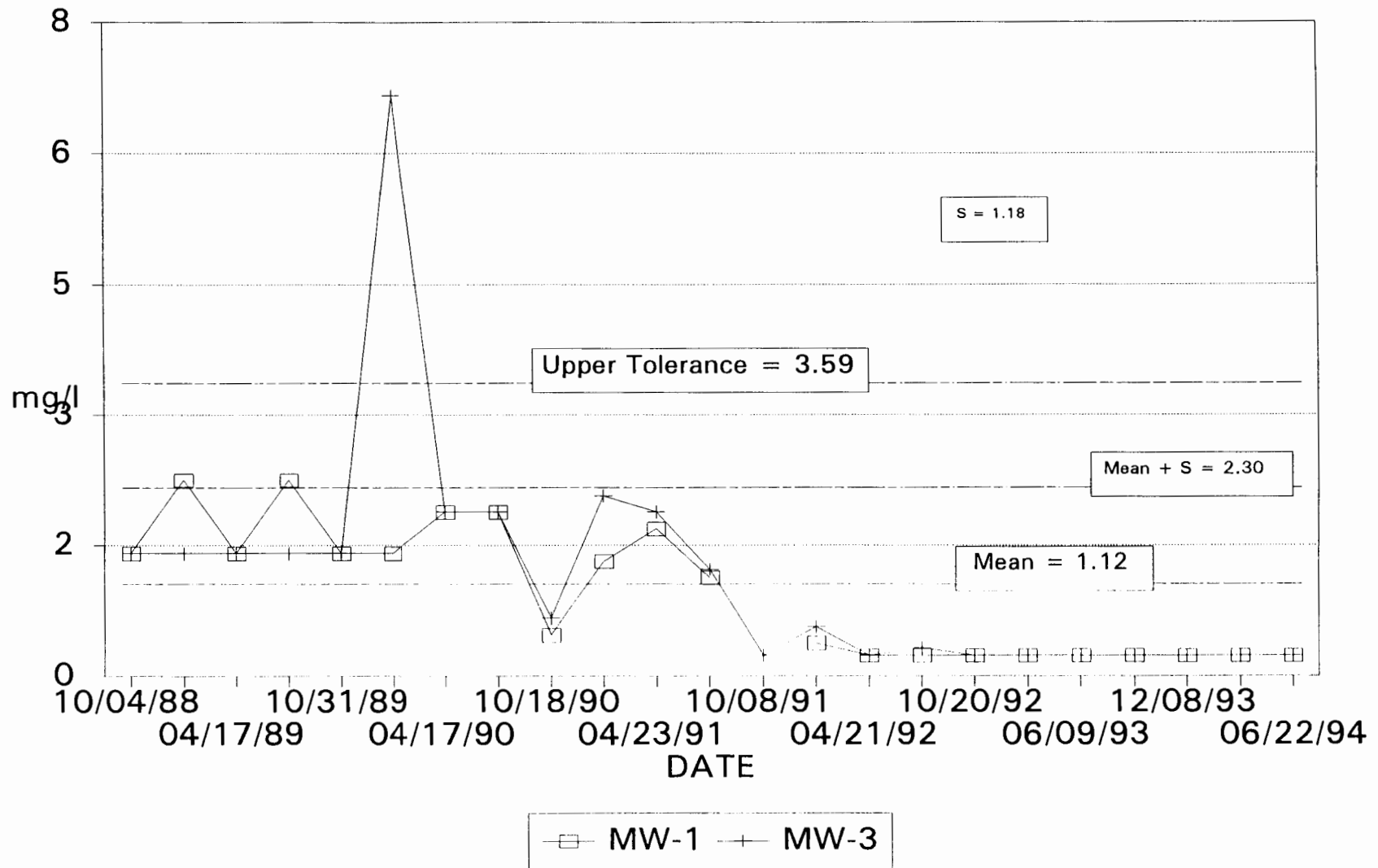
# SULFATE

## MONITORING WELLS MW-1 AND MW-3



# TOTAL ORGANIC CARBON

MONITORING WELLS MW-1 AND MW-3



# TOTAL ORGANIC HALOGENS

## MONITORING WELLS MW-1 AND MW-3

